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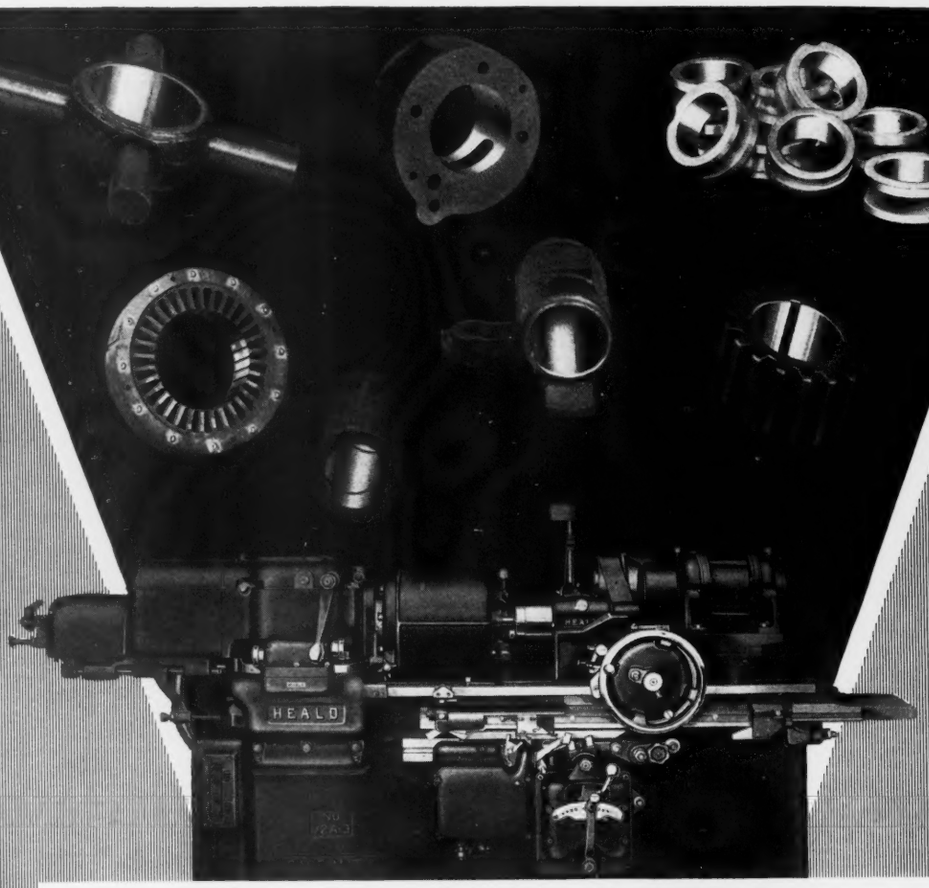
FOR MASS PRODUCTION OF STRAIGHT OPEN HOLES



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HEALD

MACHINERY

Volume 37 NEW YORK, SEPTEMBER, 1930 Number 1

Making the Wasp Airplane Engine

Methods Employed at the Two Million Dollar Plant Recently Completed by the Pratt & Whitney Aircraft Co.—First of Five Articles

By FREEMAN C. DUSTON

THE Pratt & Whitney Aircraft Co., builder of the internationally famous "Wasp" and "Hornet" engines, was incorporated in July, 1925, under the sponsorship of the Pratt & Whitney Co., Hartford, Conn., which has been engaged in the manufacture of precision tools for nearly three-quarters of a century.

Among the organizers of the aircraft company were F. B. Rentschler and George J. Mead, both of whom had had unusually broad experience in the design and manufacture of aviation engines. These men, with several associates who are now officers of the company, undertook the design of the 400-horsepower air-cooled radial aircraft engine which later became known as the "Wasp."

The actual design was begun August 1, 1925, and the first engine was ready for its running tests on December 24, 1925. The tests proved so satisfactory that the Government immediately became interested in the newly developed engine which was destined to power our present fleets of fighting planes, including the Boeing fighters used by the Navy's famous "High Hat" stunting team.

With the demand for "Wasp" and "Hornet" engines constantly growing, it became necessary to increase the manufacturing facilities, and in January, 1930, the Pratt & Whitney Aircraft Co. moved into its new $2,000,000 plant at East Hartford, Conn., which is one of the most modern plants of its kind in the world, having a floor space of 500,000 square feet. The plant employs more than 1000 men in its various departments, including a highly trained engineering personnel. The monthly production is approximately 200 engines.

A large airport is now being developed adjacent to the plant which will cover 500 acres. This airport will serve as the eastern terminus for all the units of the United Aircraft and Transportation Corporation, of which the Pratt & Whitney Aircraft Co. is a division. The airport will also be used for testing and experimental purposes by the company and by the new Chance Vought plant of the United Aircraft and Transportation Corporation, which is located nearby. This combination of plants and airport forms an ideal arrangement for experimental and research work.

Materials of the Highest Standard are Required

All forgings, castings, and bar stock entering into the construction of the engines must pass exacting tests and inspections. The physical and chemical laboratories have complete control over all heat-treating operations and keep accurate records of the treatment each part receives. After heat-treatment, all parts must be approved by the laboratory before any further work is done on them. Each part is stamped with its individual heat-treatment number, and this number is immediately restamped on the part if removed by machining operations.

All forgings are checked for hardness when received at the plant and are marked with a lot number which is identified with the lot number and heat number of the steel mill and forging shop. Accurate records of the physical tests are placed on file.

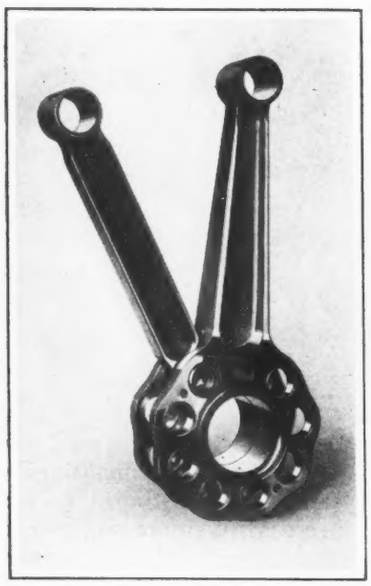


Fig. 1. One-piece Master Rod with One of the Eight Link Rods Pinned to the Hub

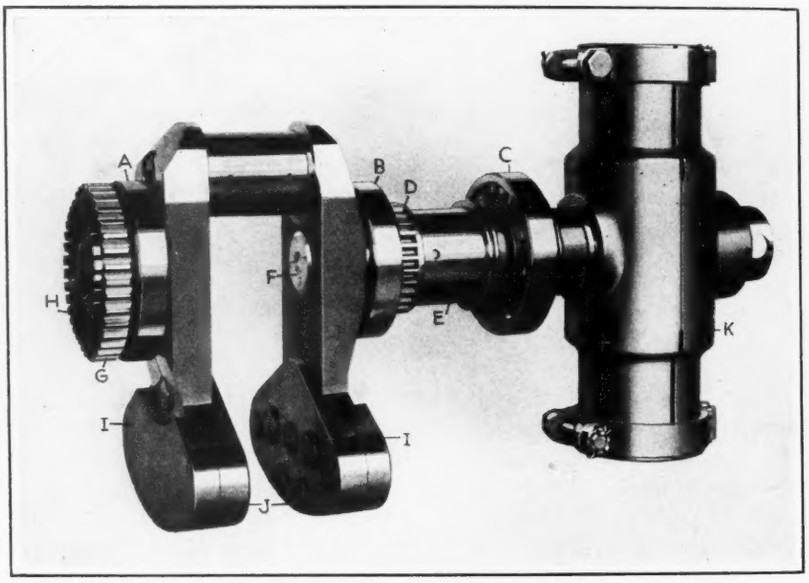


Fig. 2. Two-piece Crankshaft Assembled without the Master Connecting-rod, but with the Propeller Hub, Driving Pinions, and Ball and Roller Bearings in Place

Important parts, such as the master connecting-rod and crankshaft members, shown in Figs. 1 and 2, are given special or individual serial numbers. A complete history of each of these parts is kept on record for reference at any time.

The rough forgings are etched, after which they are carefully examined for cracks, laps, seams, or any surface imperfections. In some cases, a certain number of forgings are taken from each lot and sectioned and etched in order to show the grain flow. This method of examination is applied to gear blanks, connecting-rod forgings, crankshaft forgings, and various other parts.

Methods of Testing and Inspecting Castings

All castings are inspected at the foundry for "shrinks," misruns, and misplaced cores. A tensile test of bars cast from the same heat of metal and a hydraulic or water test are also applied. When the castings are received at the plant, the raw material inspection department tests them for hardness and gives them a close examination for dimensional defects.

Many castings are subjected to water pressure tests before and after machining. All pistons, for example, are tested before and after machining at a pressure of 500 pounds per square inch. These parts must pass this test without showing any signs of leakage. In some cases, parts are subjected to water pressure tests after assembly. For example, after the cylinder head is shrunk on the cylinder barrel, the assembly is tested under a water pressure of 500 pounds per square inch.

Testing Bar Stock and Finished Parts

All bar stock is tested when received at the plant before it is placed in storage. The recorded tests made at this time show the hardness and chemical composition. Each lot of material is stamped with a serial number; each bar is checked for hardness on both ends and in the center; and an etched piece from each bar is examined to insure freedom from cracks, laps, pipes, and other imperfections.

Every piece of bar stock used for the more important parts, such as the piston- and knuckle-pins, for example, is analyzed for chemical composition. Each of these parts is stamped with the serial number of the bar from which it is made, and this number is carried through to the finished pin, so that its entire history can be traced by permanent records, even back to its origin at the rolling mill.

Features of Master Rod and Crankshaft Design that Made Higher Speeds Possible

In Fig. 1 is shown the master connecting-rod and one of the eight link rods of the "Wasp" engine. The pistons, which fit into the nine radially positioned cylinders, are connected to the outer ends of these rods by the piston-pins. A counterbalanced crankshaft on which a master rod is to be assem-

bled is shown in Fig. 3. It will be seen from this illustration that the crankshaft is constructed of two pieces instead of a single piece, which makes it possible to assemble the solid master rod on the crankpin of the single-throw crankshaft.

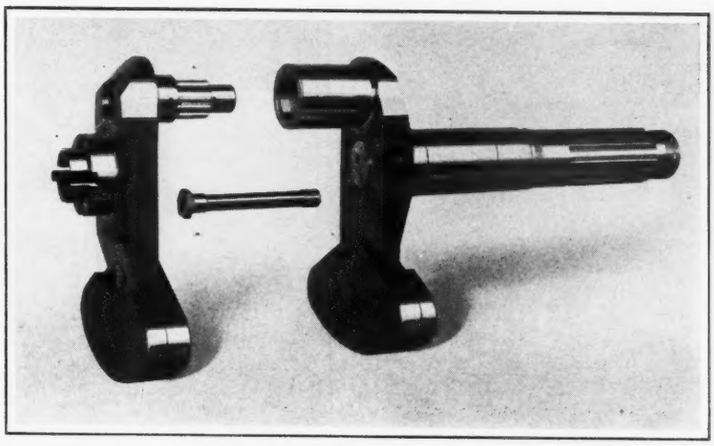


Fig. 3. Two-piece Construction of Crankshaft Parts Permits the Solid Master Rod to be Assembled on the Crankpin

The crankpin bearing is machined integral with the forward part of the shaft on which the propeller hub is mounted. The rear portion, or crank cheek, has a splined hub which telescopes into the splined hole in the crankpin of the forward section. The splines hold the two pieces in alignment, and the threaded through bolt shown in the illustration is used to secure the assembly, as well as to provide a means for drawing the parts together or forcing them apart.

The construction of the one-piece master rod makes it possible to employ speeds of 2100 revolutions per minute safely, and these engines have been flight-tested at much higher speeds. With the one-piece rod, a much more efficient main bearing can also be used.

The crankshaft shown in Fig. 2 is supported by roller bearings *A* and *B* and a ball bearing *C* just in back of the propeller hub, which takes the propeller thrust as well as the radial load. At *D* is the pinion gear which drives the valve-operating cam shown in the testing fixtures, Fig. 7.

The drive is through an intermediate gear and pinion, the latter meshing with the teeth at *B* and driving the cam in a direction opposite to that of the crankshaft, and at one-eighth the speed. The sleeve *E*, Fig. 2, forms a bearing for the hub of the cam-drum. A hollow ring fitted over the cam-drum hub and connected with the pressure lubricating system feeds oil into a cavity in the crankshaft through the sleeve *E*, Fig. 2. The cavity in the crankshaft is closed at one end by the plug *F*. The oil is forced through a hole in the crankshaft cheek to the crankshaft bearing, and thence through holes to the bearings of the eight link rods. The oil is also conducted through a hole in the rear cheek to other bearings at the rear.

The gear at *G* meshes with three gears, two of which drive such accessories as the ignition magnetos, oil pressure pump, tachometers, and gun synchronizers, while the shaft of the third gear provides a drive for the engine starter, and in some instances, is also used to drive an electric generator. Assembled within gear *G* is a friction clutch having teeth *H* which engage the gear drive of the General Electric centrifugal supercharger that delivers the fuel mixture from the carburetor to the cylinders.

Types of Machine Tools Used in Producing Engine Parts

The machine tool equipment of the new Pratt & Whitney Aircraft Co.'s plant includes practically all types of standard machines and many special

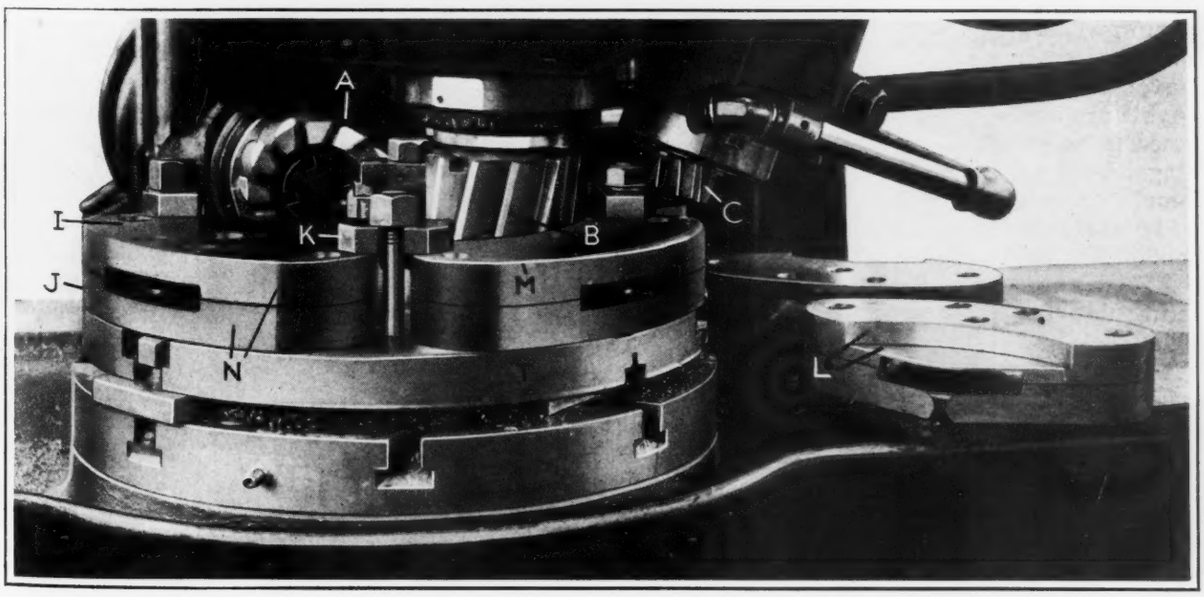


Fig. 4. Set-up for Milling Crankshaft Counterweights

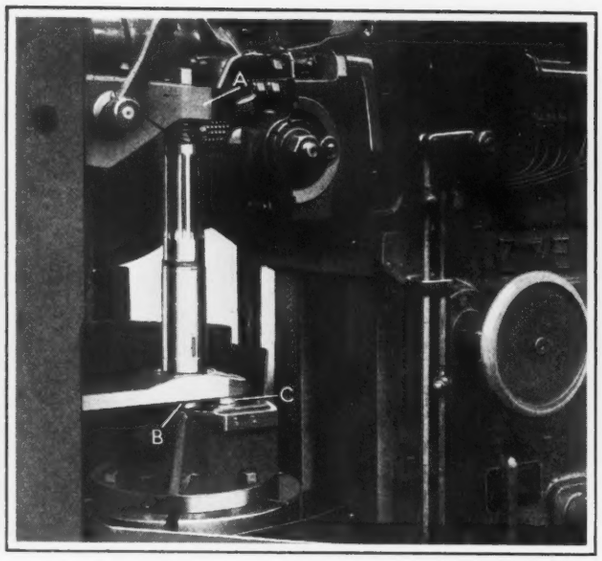


Fig. 5. Hobbing Splines on Crankshaft within Limits of Plus or Minus 0.0005 Inch

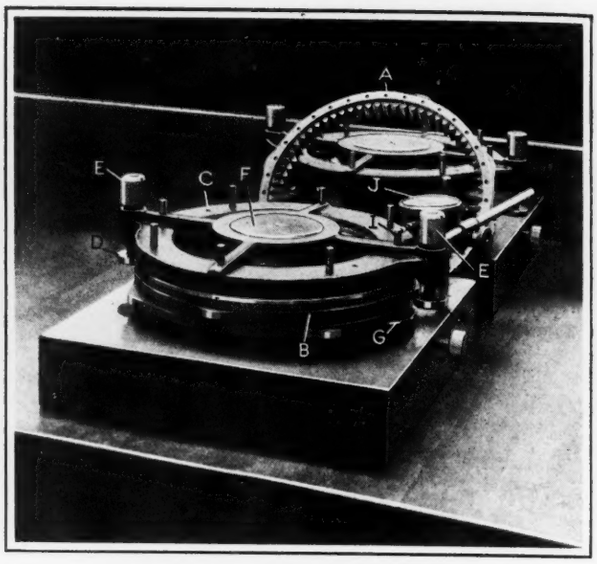


Fig. 6. Gaging Fixture Used in Testing Gear Teeth of Cam for Backlash

machines. Approximately, forty machine tools made by at least ten different manufacturers are employed in the connecting-rod department alone, where about forty operations are required to produce the master rod shown in Fig. 1.

A typical example of the many specially equipped machine tools employed is illustrated in Fig. 4. A standard milling machine with a specially designed head is provided with three spindles which drive the cutters *A*, *B*, and *C*. These cutters perform machining operations on the crankshaft counterweights shown at *I* and *J*, Fig. 2. The forgings for the counterweights are milled on the flat sides and drilled before being clamped on the continuously rotating milling table *T*, Fig. 4. The counterweights are machined in pairs, being loaded or clamped in position at the front of the table. Studs, projecting into the drilled holes in the forgings, serve to locate them accurately on the table, where they are held securely in place by clamps *K*.

The table rotates counterclockwise, the upper surface of the forging *I* being milled out, as indicated at *L*, by the cutter *B*, while the cutter *C* chamfers the edge *M*. As the forgings *I* and *J* pass the end-facing cutter *A*, the outer surfaces *N* are machined to the required radius. The four work-holding positions permit the work to be clamped on the table at the front of the machine, so that the milling operation is continuous. One set of counterweights is milled every six minutes.

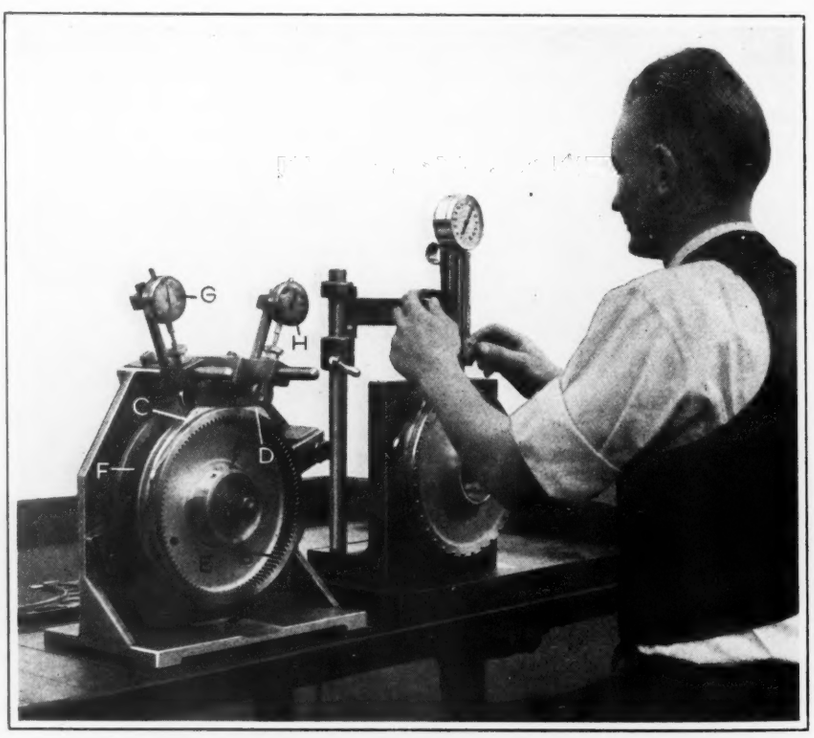


Fig. 7. Applying the Scleroscope Hardness Test to Cam Surfaces; the Fixture to the Left is Used for Testing the Concentricity and Angular Spacing of the Cam Lobes

Splining End of Crankshaft for Propeller Hub

In Fig. 5 is shown a hobbing machine equipped with a special fixture for holding the crankshaft while hobbing the splines that fit into the splined hole of the propeller hub. This operation finishes the machining of the splines to the required tolerance of plus or minus 0.0005 inch in about thirty-five minutes. Attention is called to the unusually rigid support given the work by the fixture and the supporting arm *A*. A plug at *B* locates the lower end of the crankshaft, and crankpin *C* drives the work.

Machining Operations on Cam Rim

More than thirty operations are required in producing the cam rim shown at *A*, Fig. 6. These include four machining operations on automatic chucking machines; two gear-cutting operations; five operations on drilling machines; one cam-profile milling operation; one cylindrical grinding operation; one cam-profile grinding operation; and one operation on a tooth chamfering machine.

At least five inspection operations are performed during the production process, each of which is carried out in accordance with instructions given on operation sheets. These inspections are made in addition to the accurate gaging and measuring carried out in connection with each machining operation. Other work covered by the operation sheets includes bench work and the various heat-treatments given the cam rim.

Turning and Facing Operations on Automatic Chucking Machines

After the rough forging for the cam rim has been inspected, it is machined in a chucking machine. The jaws of the chuck grip the forging on the inner surface with the inlet cam side toward the tools. A "Go" and "Not Go" snap gage is used to test the outside diameter of both cams.

The fourth operation consists of rough-cutting 105 teeth in the cam rim, leaving the teeth approximately 0.035 inch thick to permit taking a finishing cut. The fifth operation is performed in the heat-treating department, the work being normalized at a heat of 1750 degrees F.

Inspecting Cam Rim Gear Teeth for Backlash

After practically all the machining operations have been performed on the cam rim, it is subjected to various tests before being assembled or fitted to the cam-drum. The two fixtures shown in Fig. 6 are used in testing the gear teeth of the cam rim for backlash. The cam rim at *B*, which is undergoing the test, is held in the member *C* of the fixture by the clamping heads *D*, which are tightened on the cam lobes by turning the knurled nuts *E*. The member *C* is placed over the arbor *F* with the teeth engaging a pinion at *G*, which can be clamped in a fixed position by tightening screw *H*.

The member *C* is revolved until pin *I* is in contact with the anvil of indicator *J* before screw *H* is tightened. By moving member *C* back and forth, the indicator *J* will show the amount of backlash in the cam rim teeth where they mesh with the gear mounted on member *G*. The eight vertical pins *I* are all used in the same manner and provide for testing the backlash in the teeth at eight different points. At each of these points, the amount of backlash must be held within limits of plus or minus 0.002 inch.

Testing the Concentricity and Angular Positions of the Cam Lobes

At the left, Fig. 7, is shown a fixture employed for testing the concentricity and angular spacing of the cam lobes after the rim has been assembled on the cam-drum *E*. The assembly to be tested is mounted on the graduated faceplate *F*, which can be easily revolved and clamped in any desired position. The contact roller of indicator *G* rides on the cam that actuates the exhaust valve, while the contact roller of indicator *H* rides on the cam that operates the inlet valve push-rod.

When the cam assembly is revolved, the contact rollers of the indicators ride on the profile surfaces of the cams. The profiles of these cams are required to be very accurate with respect to form and spacing. By observing the readings of the two indicators while the cam assembly is being slowly revolved, the inspector can readily detect any inaccuracies.

To the right in Fig. 7 is shown an inspector testing the cam lobes for hardness by means of the scleroscope. The entire periphery or bearing surface of each cam is tested thoroughly with this instrument at close intervals. In order to pass inspection, the cams must show scleroscope readings between 75 and 80 at all points.

Cooperative Education in the Motor City

By the erection of a modern building thoroughly equipped for cooperative high-school education, the city of Detroit has placed its stamp of approval upon this ever-growing method of instruction. Cooperative training was started here in May, 1928, with an enrollment of thirty-five boys, in an old eight-room building that had been assigned by the school authorities for the purpose. In the following November, when the enrollment had more than doubled, the building burned to the ground.

A new building has now been erected at a cost of $350,000; the machine shop alone has equipment worth $45,000. About 600 boys are enrolled. The new building comprises the first unit of a plan intended to accommodate 3500 students.

That industrial Detroit is wholeheartedly behind cooperative education is indicated by the fact that forty-seven concerns make use of the Cooperative High School's facilities. Some of these concerns are the General Motors Corporation, the Chrysler Corporation, the Packard Motor Car Co., the Cogsdill Mfg. Co., the Ex-Cell-O Aircraft & Tool Corporation, the National Twist Drill & Tool Co., and Whitman & Barnes, Inc.

In planning the programs followed in the cooperative high school, the assistant principal, O. F. Carpenter, who is in charge of this school, relies considerably upon an advisory committee made up of fourteen men chosen from industrial concerns that are helping to train the students.

Our Experience with Tungsten-Carbide Tools

A Record of the Results Obtained in a Machine Tool Plant Using Tungsten-carbide Tools for Everyday Machining Operations

By J. B. DOAN, President, American Tool Works Co., Cincinnati, Ohio

THE use of tungsten-carbide tools—especially Carboloy—at the plant of the American Tool Works Co. dates back to March, 1929. Since that time this new cutting alloy has been applied gradually to more and more jobs, having been found especially successful in the turning, boring, and facing of cast-iron and semi-steel castings. The new tools have been found particularly applicable when the cut is such that a sufficiently high speed can be obtained to get real benefit from the cutting qualities of these tools.

Among the operations being performed with Carboloy tools may be mentioned the turning and boring of column sleeves for radial drills, as well as the columns themselves; the turning and boring of column rings for radial drills; the rough-turning of lathe faceplates; and the turning of cast-iron sleeves for both radial drills and lathes. Semi-steel gear blanks have also been machined to advantage with these tools. It may be of interest to mention that the lathe faceplates are made from a cast iron containing 25 per cent of steel and that the cut is intermittent; nevertheless, the tools have given excellent service.

Speeds and Feeds that are Practicable for Tungsten-carbide Tools

In turning the kind of cast iron used in our plant with a good grade of high-speed steel, we have found that for roughing cuts, 45 to 60 feet per minute is the best cutting speed. In using Carboloy tools, we have found a cutting speed of from 125 to 150 feet per minute to be the most practicable, although cuts have been taken successfully at a speed as high as 300 feet per minute. For steady commercial production, however, we find that a cutting speed of about 150 feet per minute is the most economical for roughing. With this speed, it is possible to take a heavy cut through scale. The depth of cut generally encountered in our shop varies from 1/4 to 3/4 inch, with a feed varying from 0.050 to 0.065 inch. In taking light cuts, not more than 1/8 inch deep, for example, much higher speeds can be used—in fact, speeds even higher than are obtainable at the present time on most machine tools.

On semi-steel castings, approximately the same speeds, feeds, and depths of cut are recommended as for cast iron. We have not used Carboloy tools to any great extent in cutting steel, because it is our experience that at the present stage of development these tools are not applicable for general use on steel, although they have been found to give satisfactory service in many special instances. In one case, steel forgings, made from a very tough grade of steel, that were formerly machined at a cutting speed of 45 feet per minute were machined successfully with Carboloy tools at a cutting speed of 90 feet per minute, using a 1/4-inch depth of cut and a 1/64-inch feed.

Definite Savings Have Been Made by the Use of Carboloy Tools

In our plant, definite savings have been made by the use of these new cutting tools. The machining time has been reduced; also, because of the lasting quality of the tool, fewer grindings are required. This means fewer set-ups of the tools, and in that way, a great deal of time is saved; furthermore, there are no interruptions in the machining work. These savings have more than made up for the additional cost of the more efficient new cutting tools. Another great advantage that involves a considerable saving is the fact that the new tools are not affected by the scale on castings.

In arriving at the most economical cutting speeds, the lasting qualities of the tools should be carefully considered. In most instances, greater savings are to be obtained by reducing the number of times that the work has to be interrupted and the tools reset, because of regrinding, than by increasing the cutting speed to the highest limit of which the tools may be capable. This is especially true as regards the application of these tools to turret lathes, where the resetting of the tools takes considerable time.

Carboloy Tools Cannot be Used Successfully in Out-of-date Machines

Perhaps the most important precaution that should be mentioned is that Carboloy tools cannot be used successfully in old, out-of-date machine tools that do not have a sufficiently rigid support for the tool and that lack the necessary power and speed. When used in such machines, there is almost invariably chatter, which is the most fatal condition encountered in the use of these tools. On the other hand, extended experience with these tools in regular manufacturing work for over a year has proved that they can be used successfully in present-day modern tools of high-grade design.

The idea that all machine tools would have to be redesigned in order to provide the required speed and power for the advantageous application of tungsten-carbide tools has proved to be erroneous. This assumption is not warranted by the facts, as our own experience has proved that many of the well-known heavy-duty makes of modern machine tools possess the required rigidity and power for the successful application of the new tools.

Increasing Output by Reciprocating Milling

First of Two Articles Describing Production Jobs on which Duplicate Fixture and Cutter Arrangements are Effectively Employed

By FRANK W. CURTIS, Research Engineer, Kearney & Trecker Corporation

THE process termed "reciprocating milling" consists of feeding the table first in one direction and then in the other, so that fixtures mounted on the table on opposite sides of the cutters will be brought alternately into the proper machining position. Thus, the work held in one fixture can be machined while the other fixture is being reloaded. This reciprocating action of the table is continuous and keeps the machine actually engaged in cutting metal the greater part of the time, so that substantial production increases, ranging up to 100 per cent in some instances, can be attained. In reality, the process is nothing more than the application of dual tooling arranged to suit the type of cut or cuts required.

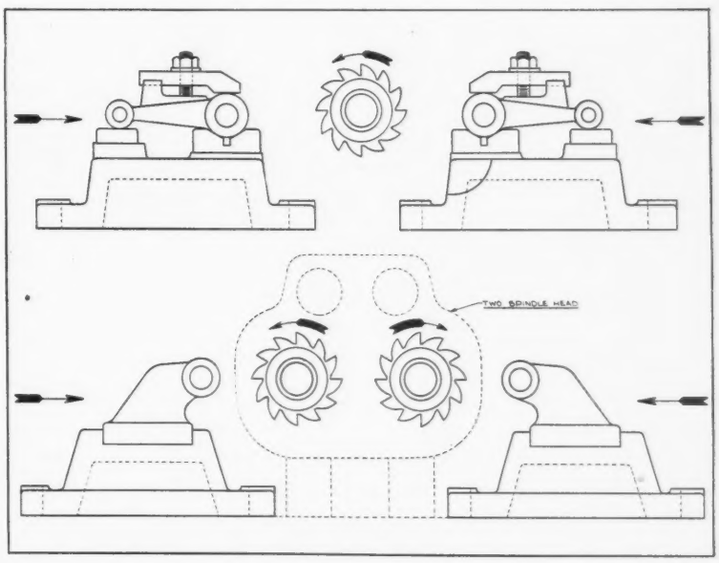


Fig. 2. Diagrams Illustrating Single- and Double-spindle Set-ups for Reciprocating Milling

The field of application of reciprocating milling is rather broad, since this operation can be arranged for face, straddle, and form milling where quantity output is wanted and where the loading time of the operation consumes a large part of the floor-to-floor time. To illustrate the advantages of a reciprocating set-up, let us assume that to finish a surface of a small casting, a table travel of 5 inches is required, and that a feeding rate of 5 inches per minute is used, resulting in a cutting time of 1 minute. Allowing 10 seconds for returning the table and 40 seconds for loading, the total floor-to-floor time for a plain type of fixture would be 110 seconds.

With opposite type fixtures, however, the loading time would be eliminated, since one of the fixtures would be in use during the loading operation. On this basis, therefore, the floor-to-floor time would be 70 seconds. Thus, the difference in floor-to-floor time represents an increase in production of 57 per cent, with the added advantage that greater returns will be realized on the machine investment.

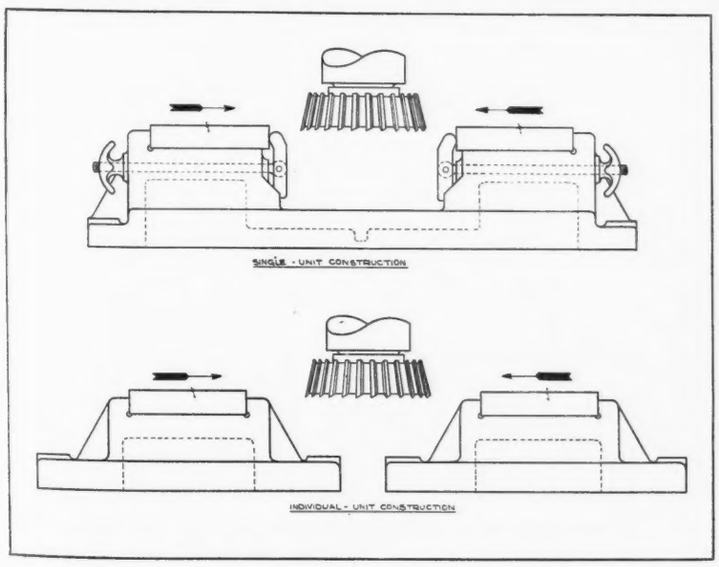


Fig. 1. Reciprocating Milling Fixtures of Single- and Individual-unit Construction

Of course, some classes of work can be handled more satisfactorily in a plain fixture, while others are better suited to rotation- or index-milling. Nevertheless, there is a broad field of application for reciprocating milling operations in the average manufacturing plant which is often overlooked. The examples from actual practice described in this article give some idea of the scope of the method.

Two types of fixtures can be used for reciprocating operations, namely, those of single-unit construction and those of individual-unit design. In the single-unit design, both fixture members are an integral unit, as shown in the upper view of Fig. 1. In the individual design, separate fixtures are clamped on the machine table opposite each other, as shown in the lower view. In either type, the fixture

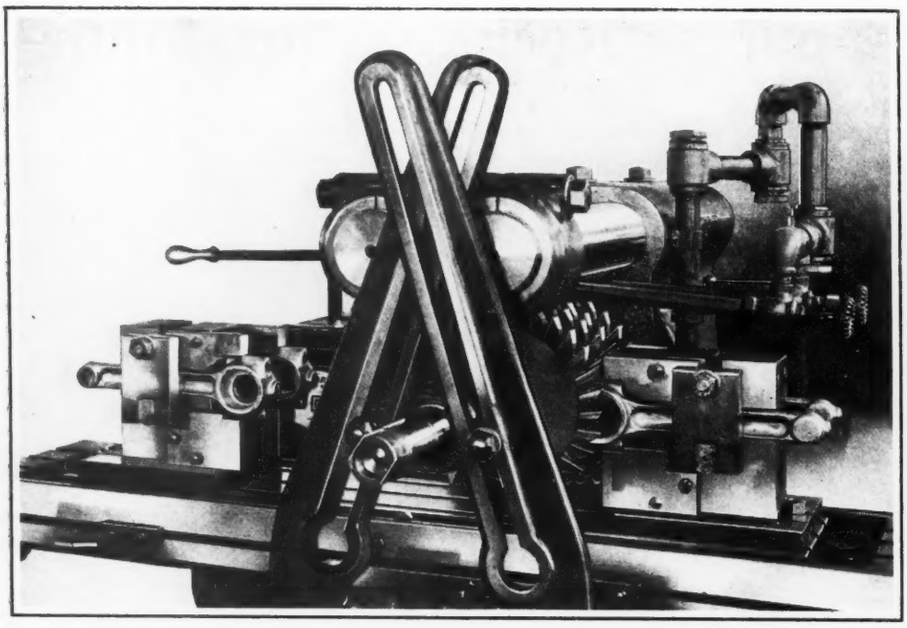


Fig. 3. Using Four Cutters on One Spindle for Milling Sides of Two Connecting-rods Simultaneously

can be of the cast or built-up type. If the design is of plain construction, the single unit will be found satisfactory, but if the design is somewhat complicated, individual units are to be preferred, as they eliminate the long base casting or baseplate, which is likely to become sprung or distorted. If cast construction is used, the same pattern can often be utilized for both fixtures.

Application to Single- and Multiple-spindle Machines

Single-, double-, or multiple-spindle machines, of either the horizontal or vertical type, can be used for reciprocating milling. In the upper view, Fig. 2, is shown a set-up arranged for a single-spindle machine, and in the lower view, a set-up for a double-spindle machine. When a vertical machine is used for a face milling cut, a single-spindle set-up will be found entirely satisfactory, as the thrust on the table is downward when the work is fed in either direction.

For horizontal milling, however, it is preferable that the arrangement be such that the cutter teeth approach the work in a downward direction. If a single spindle is used, and if the same cutter is to be used for both fixtures, this action will be attained only on one side, whereas on the opposite side, the condition will be reversed —that is, the teeth will be rotating in an upward direction when they approach the work and will thus have a lifting effect.

For this reason, the scope of a single-spindle horizontal machine is somewhat limited, being suited only for operations requiring light cuts or where ample rigidity is maintained by means of a sturdy fixture designed to withstand the upward cutting action. With a double-spindle machine, or a machine equipped with a two-spindle head, this source of vibration is eliminated, since the spindles are rotated in opposite directions, one being used for the fixture on one side and one for the fixture on the other side, so that a downward cutting action is obtained in both cases.

A reciprocating set-up for straddle-milling the large end of an automotive connecting-rod is shown in Fig. 3. In this example, a single-spindle machine equipped with four 8-inch side-milling cutters is used. The fixtures are of such heavy construction that there is practically no vibration while the cutters are in operation. Two rods are held in this fixture by hinged-type clamps which are locked in place by eyebolts, a design which permits rapid loading. Approximately 1/16 inch of metal is removed from each side of the rods, the production being 200 pieces per hour.

Eliminating Chatter or Pounding of Gang Cutters

When gang cutters are used for milling, the teeth of the different cutters should be staggered

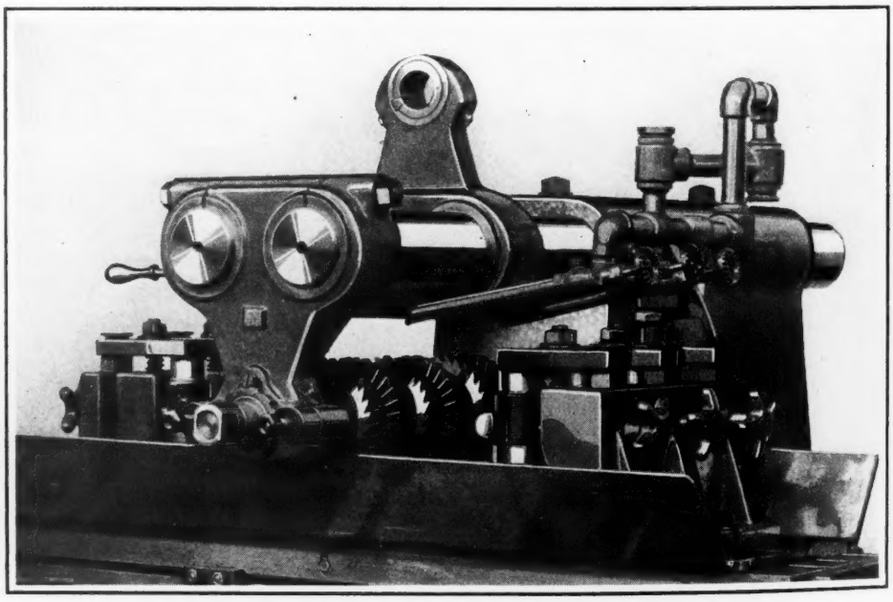


Fig. 4. Set-up for Milling Universal Joint Housings Shown in Fig. 5

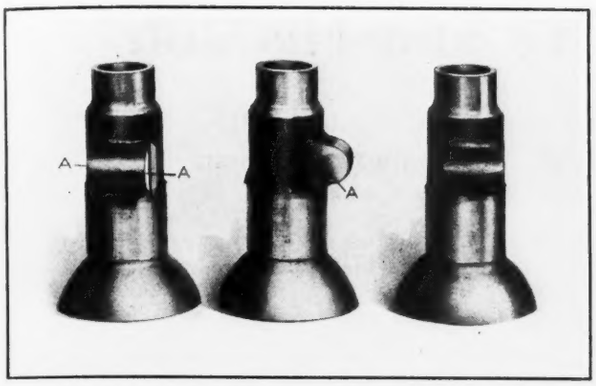


Fig. 5. Universal Joint Housings Milled on Faces A in the Set-up Shown in Fig. 4

in most cases, so that they strike the work in succession rather than simultaneously. In the set-up shown in Fig. 3, the teeth are staggered sufficiently to give a uniform cutting action, thus eliminating the pounding that would result if the teeth of all the cutters were set in line so that four teeth would strike the work simultaneously. Many gang cutter set-ups have given trouble simply because this precaution was overlooked, and production has often been sacrificed as a result, because of the necessity of using lower feeding rates.

A conventional form of universal joint housing for automotive use is shown in Fig. 5. These pieces are malleable iron castings, and require milling on each side of the projecting bosses. Ordinarily, this part would be arranged horizontally so that two cutters would pass over the boss. Such a set-up would have a fixture on each side of the table, and, naturally, only one piece would be finished at a time. However, owing to the high production required on this part, the set-up shown in Fig. 4 was devised.

In this case, two fixtures are used, each of which holds three pieces in a vertical position. The nature of the work is such that only one cut is required to produce the necessary finish. The feed is arranged to enable three pieces to be finish-milled in 45 seconds. The amount of metal removed from a side is approximately 1/8 inch, a gang of six cutters mounted on one arbor being used for this purpose. The loading time is approximately 30 seconds, so that there is ample time to reload while the work held in one fixture is being milled. The cutting action is almost continuous, the only lost time being the period in which the rapid traverse feeds the table from one side to the other.

* * *

Two turbine generators that will set several records for capacity and size are now being constructed at the Schenectady works of the General Electric Co. for installation in the Hudson Ave. station of the Brooklyn Edison Co. Each turbine will drive a single generator of 160,000 kilowatts capacity, with a maximum output of 200,000 kilovolt-amperes. Without auxiliaries or attachments, the combined weight of each turbine and generator will be more than a thousand tons.

CINCINNATI SECTION OF THE A. S. M. E. ORGANIZES FOR AN ACTIVE SEASON

An active program has been prepared by the Cincinnati Section of the American Society of Mechanical Engineers for the coming fall and winter season. R. E. W. Harrison, chief engineer of the Cincinnati Grinders, Inc., is chairman of this section, and H. C. Uihlein, secretary and treasurer of the Cincinnati Engineering Tool Co., is vice-chairman, as well as chairman of the papers and program committee. Committees have also been organized on membership, with F. S. Haas of the Cincinnati Grinders, Inc., as chairman, and on education, with John T. Faig, president of the Ohio Mechanics Institute, as chairman. Ernest F. DuBrul, general manager of the National Machine Tool Builders Association, will represent the Cincinnati Section in connection with the proposed registration and licensing of engineers. Publicity and recording of technical papers will be in charge of John M. Krings of the Cincinnati Milling Machine Co.

* * *

SIMPLE FORMULAS FOR DETERMINING THE WIDTH AT THE BOTTOM OF A SPLINE

By CARL A. E. JOHNSON

In commenting on the article on page 782 of June MACHINERY, in which formulas are given for finding the width at the bottom of a spline, the writer submits here another method for finding this dimension. The formula given is of a simpler nature than those given in the previous article, and requires less calculating to obtain the desired dimension X, as the latter may be found from angle b, thus eliminating the second and simplifying the third formulas given in the original article.

The method is as follows:

$$\text{Sin } 1/2a = \frac{A}{2R}$$

$$X = 2R \times \text{Sin } 1/2b$$

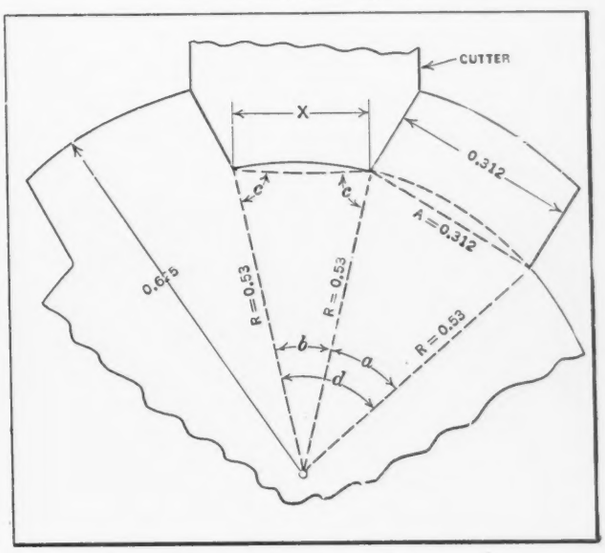


Diagram for Spline Cutter Calculations

The Shop Executive and His Job

Superintendents and Foremen are Invited to Exchange Ideas on Problems of Shop Management and Employe Relations

SHOULD TIME BE ALLOWED FOR WASHING UP?

With reference to the discussion on shop rules in July MACHINERY, page 848, it is the writer's opinion that the practice of washing up before quitting time should not be tolerated. A man is paid to work until the whistle blows. Suppose, for example, that twenty or thirty men are at work on an assembly line. The line would be inoperative if half of the men should walk away ten to fifteen minutes ahead of quitting time.

If five minutes is allowed for washing up, some of the men will soon take fifteen minutes; thus it is better not to allow any time for this purpose. The only possible exceptions to this rule might be in the case of a foundry; or where the men are entirely on piece-work; or when an operator of a machine can wash up while his machine is in operation. The writer believes, however, that making exceptions, even in such cases, is undesirable.

Tardiness should be discouraged at the start. The following rules or penalties have been found an effective means of remedying tardiness in many plants: A man may be two minutes late without being penalized; if he is from three to fifteen minutes late, his time is cut fifteen minutes; if he is from sixteen to thirty minutes late, he loses thirty minutes' time. The man who is over thirty minutes late is required to report to his foreman and obtain a permit to begin work.

Considerable educational work is required in order to make some men realize the importance of being on time. One firm has adopted the practice of furnishing each foreman with a weekly list of the names of those in his department who have been late during the week. The foreman is then required to take up the matter with each individual. It is, of course, impossible to eliminate tardiness entirely, as it is sometimes caused by conditions that are beyond the control of the men.

H. C. MEYERS

PRACTICAL RESEARCH WORK

Modern research work in a manufacturing plant does not necessarily involve the services of scientists and the creation of a large department filled with chemicals, glassware, and weighing devices. A small concern engaged in the manufacture of automotive parts has found it profitable to carry out some practical investigations which are, in reality, research work. For example, this concern desired to know if the quality of oil they were using for lubricating grinding machine spindles warranted the high price paid, and decided to do a little investigating. Accordingly they tried out a highly recommended oil which could be obtained at a much lower price, and kept an accurate record of the results.

On concluding this investigation, the concern returned to the higher priced oil because the results definitely proved it to be the better oil to use. The report on the tests showed that the bearings retained the higher grade oil much longer and that less trouble was experienced from worn spindle bearings when it was used. These grinding machines were required to handle very accurate work, and the elimination of bearing trouble alone was of much greater importance than the money saved by purchasing the cheaper oil.

An investigation of this kind, although somewhat different from the research work that results in the creation of an abrasive that is harder and better than one previously used, may, nevertheless, prove just as profitable. The expense involved in conducting tests to determine the best products to use generally pays good dividends.

W. F. SCHAPHORST

DISCUSSION ON SHOP RULES

It has been my experience that the fewer shop rules there are, the better the feeling among the men. In fact, I do not like to speak of "rules." Whenever I have charge of other men, we have a definite understanding covering mutual obligations. There is no excuse for more than a very few rules. They need cover only the hours of work, the rate of pay, the specific duties expected of each man, and the safety regulations necessary in a particular industry.

Sometimes tardiness is unavoidable and should be excused. When a man has put in over-time the night before, I believe that he is entitled to receive his pay even if a few minutes late the next morning. When there is illness in his family or when the weather or roads are bad, there should be a reasonable degree of judgment in the enforcement of penalties for tardiness. However, chronic tardiness should not be tolerated.

Cleanliness and order in the shop is a duty of the management that may seem remote from the question of tardiness, but it has been my experience that nearly everyone is anxious to give his best if he feels that it is appreciated, and the employer can show his appreciation by making the working conditions as good as possible.

I believe it is a good idea to install a suggestion box in which men may drop any suggestions they may have.

CARL A. WAGNER

SHOULD FOREMEN BE PAID BY THE HOUR OR BY THE WEEK?

In one plant, the method of paying the foremen was recently changed from an hourly to a weekly basis, with no pay for over-time. At the same time, it was made clear to the foremen that the responsibility for output and quality in their departments was entirely theirs.

As a result, the over-time work of some of the foremen decreased, while that of others increased; but the over-time work in the shop as a whole decreased. Some foremen who had felt that it was necessary to work over-time when on an hourly basis, found that they were able to produce the required output during the regular hours. Others, conscious of their responsibility, found themselves working over-time to meet the needs of the plant as a whole.

The writer believes that the weekly basis of payment for foremen is advantageous. It increases the responsibility and the self-respect of the foreman and places him in the position of a leader of his department whose main object is to see that the work entrusted to him is properly performed.

HARRY KAUFMAN

ADOPTING A MAN'S SUGGESTIONS

Experience has shown that it is not wise to change methods of doing work on the spur of the moment. A new idea for accomplishing the work in hand may not always be successful, and it should be viewed from all angles. Often the shop man is not in a position to do this.

On the other hand, when a good man is allowed to choose his own method of working, he shows greater interest in the jobs assigned to him. Suggestions, therefore, should be welcomed and, if possible, put into operation. The following rules may prove helpful in carrying out this idea: (1) If a job is set up, it should be completed according to the old method and instructions. (2) All suggestions should be submitted in writing and a statement should be made of the approximate saving in time and cost of the change in the method, tools, or fixtures. (3) These suggestions should be offered to the foreman early enough so that a change, if advisable, can be made for the next run of a job.

By allowing the men to cooperate with the management in this manner, interest and pride in the work of the shop is greatly increased.

HARRY KUPPER

DO FOREMEN APPRECIATE THE IMPORTANCE OF THEIR JOBS?

Because of the growing recognition of the importance of the foreman's job, foremen's conferences and special training methods intended to meet the foreman's needs are increasing in popularity. It is believed that in the future training schools for foremen will be a part of the industrial education in America. Any training course, to be of real value, must take into account the importance of the foreman's position and his responsibility.

When production is to be increased, manufacturing costs reduced, or planning schedules met, the foreman is the one man whose efforts are essential in bringing about the desired results. Again, when economies are to be effected by eliminating waste, the foreman's aid is of importance. In almost every direction he is the link between the management and the object to be accomplished.

The foreman is truly a key man, and unless he is considered in carrying out the plans of management, complete success can seldom be obtained. Foremen, like everyone else, are jealous of their authority, and quite often the management will do well to cater to them somewhat, if whole-hearted cooperation is to be secured.

The foreman plays an important part in waste prevention. He can see that nothing which may be used for some other purpose, in its present form or in a changed condition, is discarded. His responsibilities in the prevention of accidents are too well understood to need comment. The success of any accident prevention campaign depends on the interest of the foremen in the plant.

Many foremen do not fully recognize the importance of their position and the responsibility it entails. The more they recognize the importance of their duties, the better will they be able to perform them.

A. H. RODRICK

SHOULD PRODUCTION MACHINERY BE SOLD ON TIME PAYMENTS?

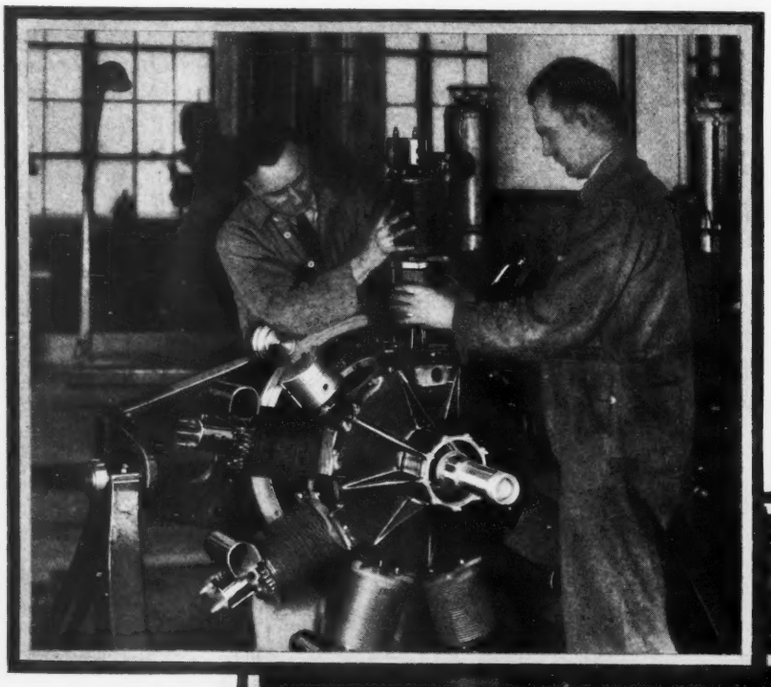
In the writer's opinion, there is quite a difference between selling production machinery on deferred payments and selling consumer goods, such as radios, automobiles, furniture, etc., on this plan.

When production machinery is sold on time payments, it is usually sold to a man or a business just starting and lacking adequate capital. The machinery manufacturer who sells on time payment to such a business actually becomes a partner of his customer. He is investing in his customer's business. If a regular policy of selling on time payments is adopted, after a while the manufacturer of the production machinery finds himself in the position of being a partner in a great many businesses competing with one another; furthermore, they are competing with the older established customers of the manufacturer. This competition is not likely to be a healthy one, because manufacturers with limited capital and debts to pay often demoralize the market by ignoring sound business principles. The conditions in the entire industry to which the manufacturer of production machinery caters become bad, and the industry as a whole is placed on an unsatisfactory basis.

I would like to know what manufacturers of production machinery themselves think on this subject. By "production machinery" I mean equipment that is used for manufacturing consumer goods rather than equipment and articles that are made for the consumption of the ultimate buyer.

OBSERVER

Building Packard-Diesel Aircraft Engines



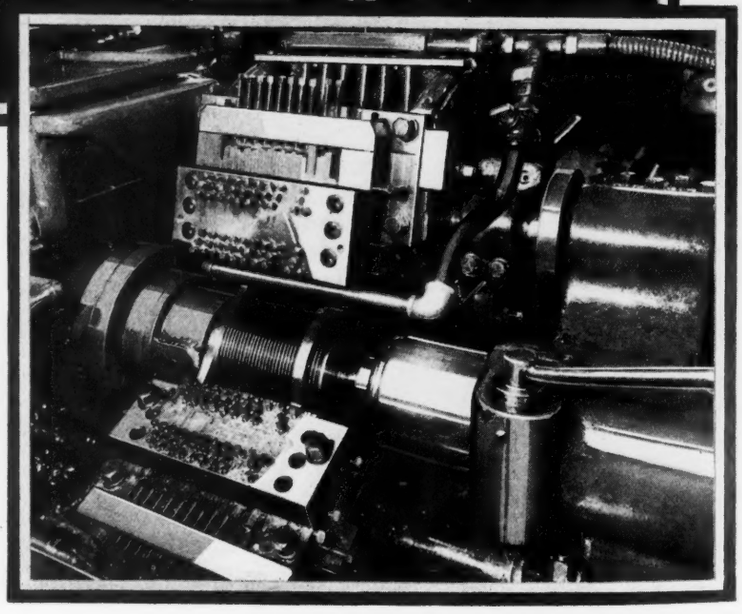
The Packard Motor Car Co. entered early into the ranks of successful aircraft engine builders. The famous "Liberty" motor had, to a large extent, Packard engineers behind it.

Recently the company has done what was hitherto considered impossible—applied the Diesel principle to aircraft engines for regular aviation service.

The accompanying illustrations show some of the methods used in a plant built by the company especially for the manufacture of Diesel aircraft engines.

The illustration above gives a good idea of the relative dimensions of the Packard-Diesel engine.

The illustration in the center shows how each cylinder is assembled as a separate unit, complete for the final assembly, with the valve ground and fitted to the valve springs, and the head attached.



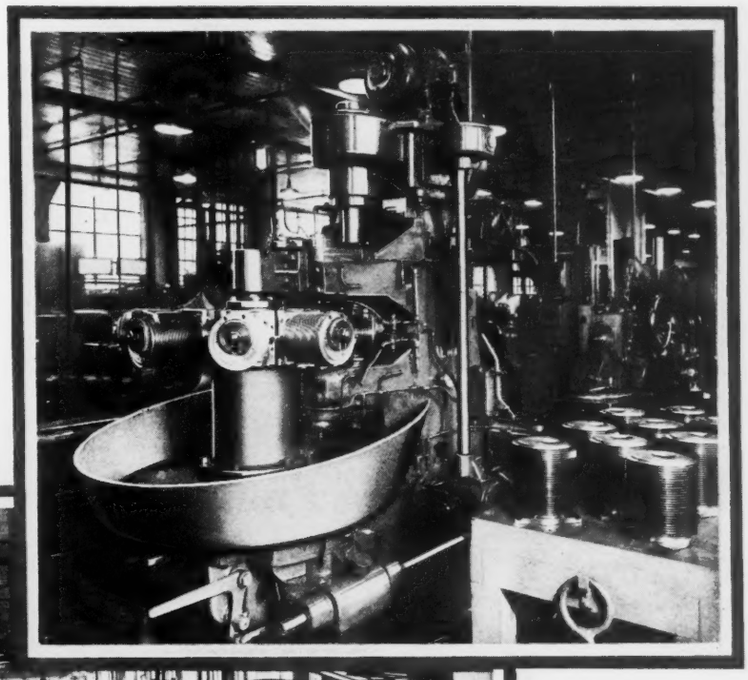
The cylinders are made from forged chrome-molybdenum steel, with an integral dome, and with an aluminum head attached by studs. The cylinders are held in place on the crankcase by two chrome-nickel hoops or annular straps; this method provides for complete security with minimum weight—requirements highly essential in all aircraft engines.

The illustration to the right shows how the cylinder fins are machined by multiple tooling equipment—an operation that at first would seem to most shop men very difficult to perform.

New Departure in Airplane Motive Power

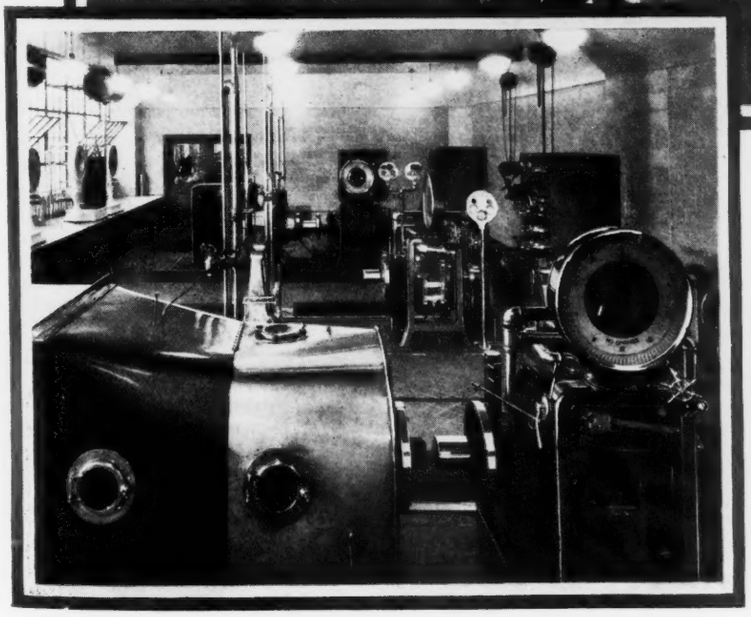
Some of the machining operations employed in the Packard plant on the Diesel aircraft engines differ considerably from those used in regular aircraft engine manufacture.

One of the unusual operations is shown to the right, where the cylinder flanges are automatically profile-milled on a milling machine especially equipped for the purpose. While standard machine tools are used as far as possible, the tooling equipment, on account of the unusual operations to be performed, is largely of special design.



The center engraving shows one of the main assembly lines.

It is of interest to note that in the Packard aircraft plant all skilled labor engaged in the assembly line is paid on an hourly basis and not on a piecework or bonus plan.



Every engine is subjected to the most rigorous tests, first in the regular inspection departments and later in a special laboratory, as shown to the left, where the required 50-hour Government tests are also performed. Air tunnels on each dynamometer force air over the engine at adjustable velocities up to 100 miles an hour.

The equipment permits of testing at conditions duplicating below-zero weather as well as intense summer heat. Fuel and lubrication oils are weighed on accurate scales to determine definitely consumption and engine performance.

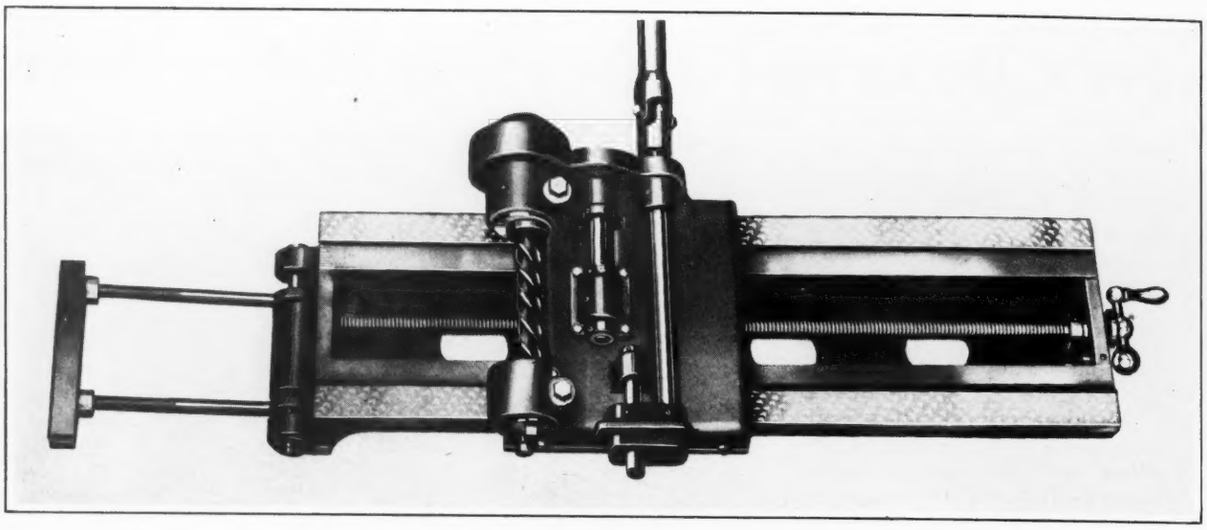


Fig. 1. Portable Locomotive Frame Jaw Milling Machine

Milling Locomotive Frame Jaws With a Portable Machine

By H. H. MOOR, Micro Machine Co., Bettendorf, Iowa

FIG. 1 shows a portable locomotive frame jaw milling machine built by the Micro Machine Co., which has proved a time- and labor-saver in many railroad shops. Shoe and wedge faces of locomotive frame jaws that are worn concave through service are straightened up quickly and accurately by the use of this machine, so that a full length bearing of the shoes and wedges is insured. The old methods of hand-filing and chipping are eliminated. The machine is capable of taking cuts up to 5/16 inch in depth. The design of the spiral cutter carriage permits the frame jaw to be milled for its full length, including the curvature at the top.

For setting up the machine, a line is scribed on the side of the frame, using a square aligned with the top of the frame. The mounting bracket which secures the lower end of the device to the frame is then adjusted until the slide-ways of the machine are parallel with the line scribed. For setting up the machine relative to the wedge side of the jaw, the same procedure is followed, except that an angular line is scribed. As indicated in Fig. 2, where the machine is shown applied to a locomotive frame, the device is driven by a pneumatic motor mounted on a stand.

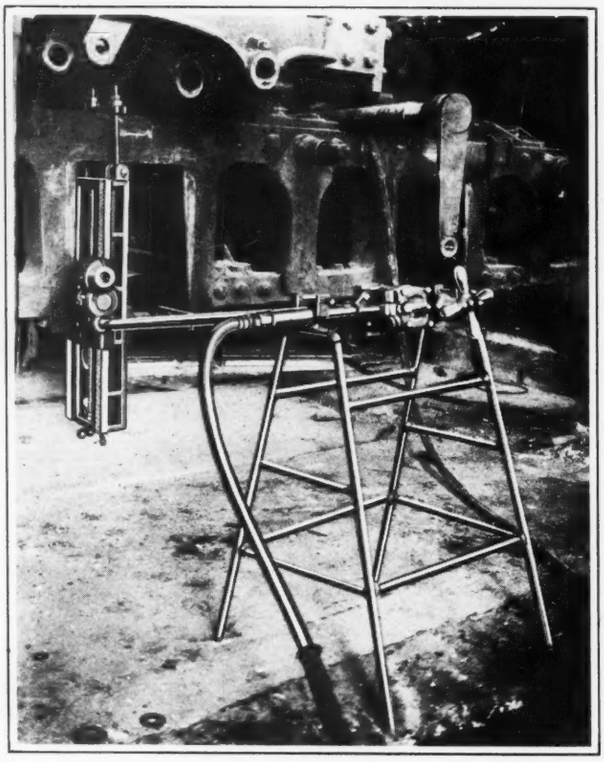
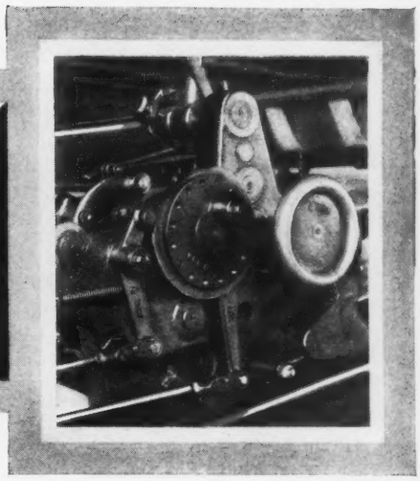


Fig. 2. Frame Jaw Milling Machine Set up Ready for Milling

* * *

Electric motors give satisfactory service for a longer period than most other types of machinery. Our attention has been called to the record of a Westinghouse 10-horsepower motor which has been in use for twenty-one years in unusually severe service in a textile mill. It was recently overhauled and is still good for many more years. It is used on a waste chopper and, when overhauled, was badly clogged up with lint and dust. In its long service, the motor bearings have been rebabbitted three times, due to lint filling the oil reservoir and preventing the oil rings from turning. In the last ten years it has been on fire three times, the lint igniting from friction, and each time a hose was turned on the windings, after which the motor was allowed to stand for twenty-four hours to dry before being put back into service.

Ingenious Mechanical Movements

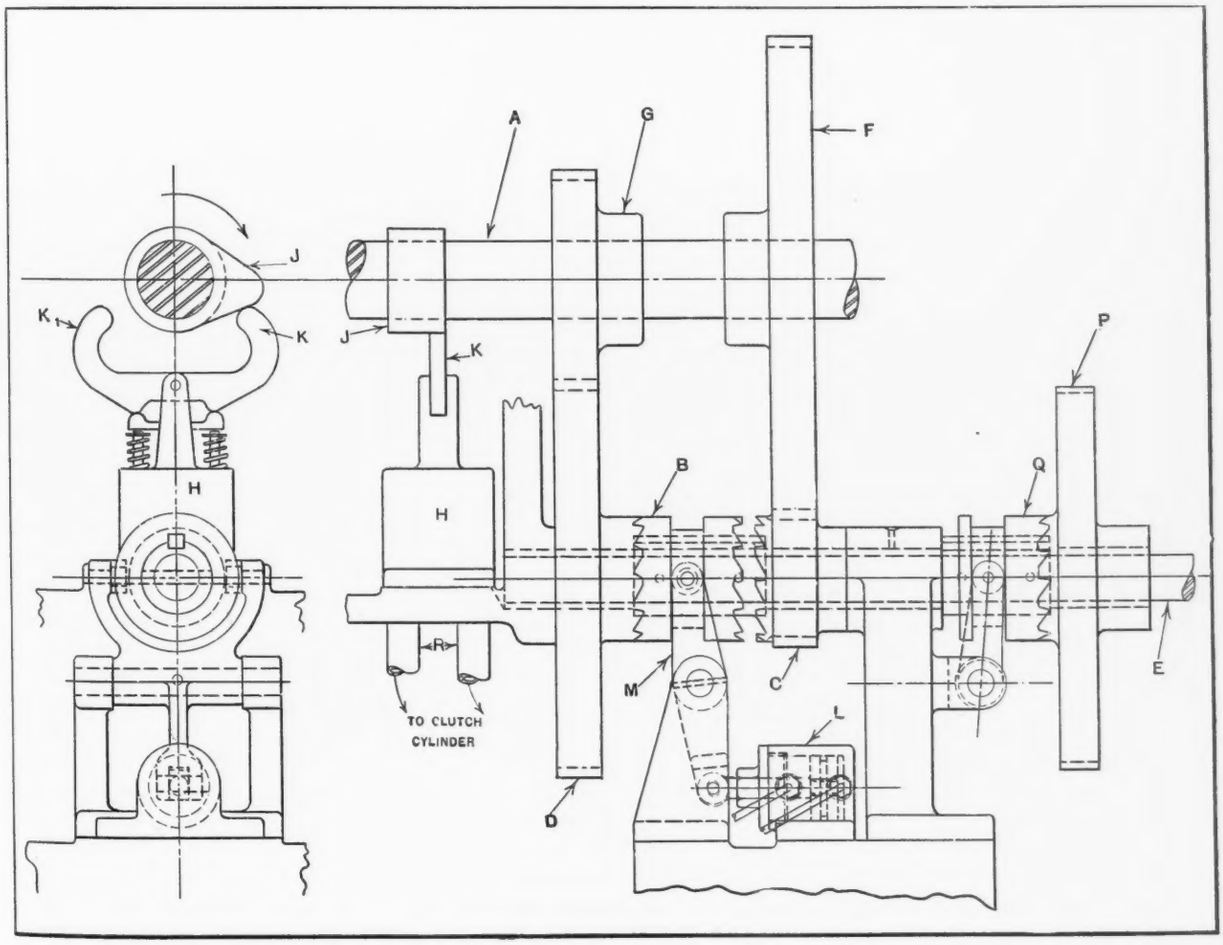


AIR-OPERATED CLUTCH FOR TWO-SPEED DRIVE

By R. E. McCOY

The speed of a shaft that drives the feeding and indexing mechanism of a multiple-spindle drilling machine must be increased from 2.13 to 15 R.P.M. to permit indexing in 1 2/3 seconds. This speed change is controlled by a cam-operated, four-way air valve and an air-operated clutch which alternately engages the high- and low-ratio gearing.

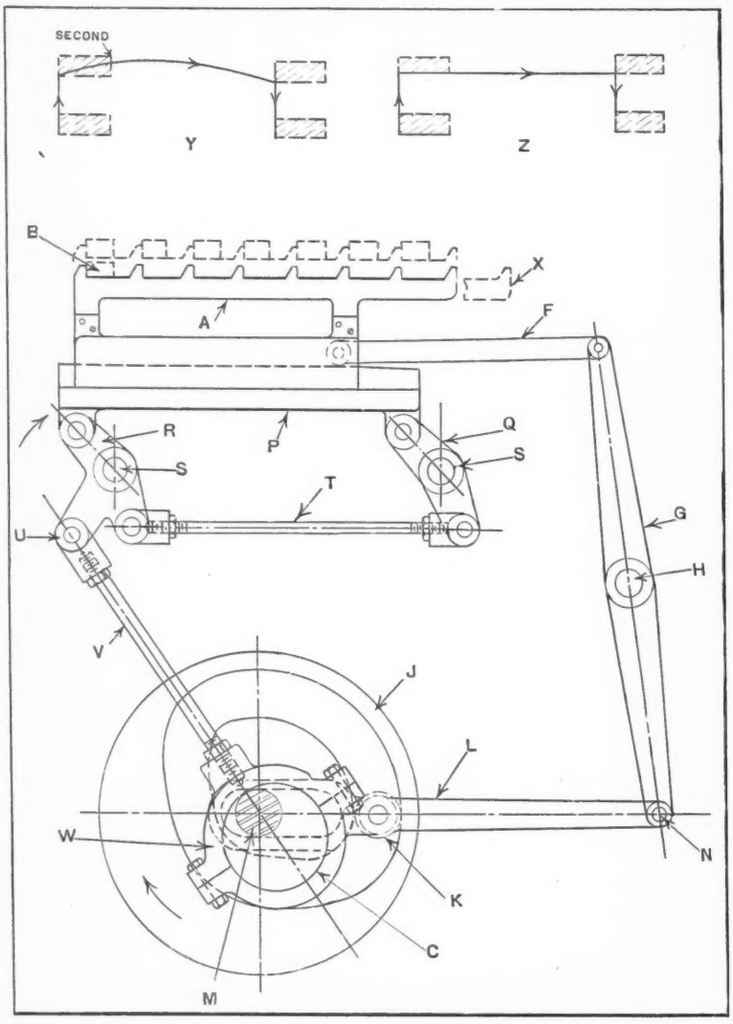
Starting and stopping of the machine is controlled by hand-operated clutch *Q* which connects or disconnects gear *P* with shaft *E*. The main shaft *A* drives the feeding and indexing mechanism only. When the machine is drilling and the feeding mechanism is in operation, motion is transmitted from shaft *E* to *A* through the low-speed gearing *C* and *F*, as a result of the engagement of clutch *B* with gear *C*. When an indexing movement is required, clutch *B* is automatically shifted into engagement with gear *D*, thus driving shaft *A* through gears *D*



Automatically Controlled Air-operated Clutch for Alternately Engaging High- and Low-ratio Gearing

and G and increasing the speed to 15 revolutions per minute, so that the indexing will be completed in the allotted time; then the clutch is shifted back automatically to the feeding position.

Clutch B is shifted by means of compressed air acting against a piston which is within cylinder L and is connected to clutch yoke M. The admission and exhaust of the air to and from cylinder L is controlled by a cam J acting in conjunction with a four-way valve H. This valve connects with the main air line, and there are two 3/8-inch pipes R leading from it, provided with reducing bushings



Mechanism for Transferring Packages from Station to Station

to fit the small tubes connecting with each end of the air cylinder L. When cam J, which is attached to shaft A, moves in the direction of the arrow, it comes into contact with end K of the air valve operating lever, thus admitting air to the left-hand end of the cylinder and exhausting it from the opposite end. The result is that clutch B is thrown into engagement with gear D, as the illustration shows. This high-speed drive of 15 revolutions per minute continues until cam J engages end K_1 of the lever, thus admitting air to the right-hand end of the cylinder and exhausting it from the left, which throws the clutch into engagement with gear C. An air pressure of 80 pounds per square inch is carried in the main line, and the total pressure exerted against the piston in cylinder L is about 98 pounds.

* * *

DEVICE FOR TRANSFERRING PARTS FROM STATION TO STATION

By H. F. SERVER

In a machine for wrapping packages, the conveying mechanism shown in the illustration is employed for transferring the packages to each successive station. In doing this, the transfer arms A must pick up the packages, carry them toward the right to the next stations, lower them into position, and then, after dropping enough to clear the bottom of the packages, return to their starting position. A package partly wrapped is deposited automatically on the carrier at B when the mechanism is moving up from the position shown.

The diagram Y indicates the path through which the packages theoretically are moved during one cycle, although they rest on bars in the upper position while the carrier drops below them when returning, the diagram representing the transfer arm travel. An eccentric in combination with a cam is used to obtain this movement, although two cams could be used that would cause the package to follow the path indicated at Z; or two eccentrics might be used if the motion imparted would be suitable.

The two carriers A support both ends of the packages, while the slide beneath supports the carriers and is connected by link F to the lever G pivoted on stud H. The slide is operated through this lever arrangement by the cam J which engages the roll K attached to the yoke L. Shaft M, which drives the entire mechanism, passes through the yoke, while a pin at N pivots the yoke to the lever. Supporting the slide that carries the transfer arms A is a bracket P to which the slide is dovetailed. This bracket is mounted on two levers shown at Q and R, which are free to pivot on the studs S.

Connecting link T ties these levers together, and increases the strength of the assembly. Forming part of the lever R is an arm U to which is pivoted a connecting-rod V fastened to the eccentric strap W. Both the eccentric C and the cam J are pinned to the drive shaft M.

In operation, as the shaft M revolves, the movement of the eccentric causes levers R and Q to oscillate in the direction of the arrow, thus raising bracket P. In the meantime, a dwell on the cam prevents the slide from moving to the right or left. When the carrier reaches the position shown by the dotted outline, the cam operates lever G, so

that the slide is moved to the right; the dwell on the cam then holds the lever stationary until the eccentric swings the lever *R* back so that the carrier will be in the position indicated at *X*. The cam then operates lever *G* to bring the slide back to its starting position.

As the eccentric travels continuously through an arc, at no time will the slide be held stationary, the path of the carriers being curved. However, for practical purposes, this departure from a straight line movement may be disregarded. If it is desired to control this mechanism so that there is no up or down travel while the slide is traversing, a cam may be substituted for the eccentric. The dwells and rises on the cams may then be varied so that the path of travel will be as shown at *Z*.

* * *

SPEED-REDUCING GEARING FOR OPERATING PRESS FIXTURE

By A. W. JANSSON

An automatic fixture for a small punch press required a cam to operate it and it was necessary for the cam to make one revolution to seven revolutions of the punch press shaft. The compact mechanism for obtaining this speed reduction is sometimes known as "wobble gearing," owing to the eccentric motion imparted to one of the gears.

The punch press shaft *A* (see accompanying illustration) has keyed to it an eccentric *B* (see also detailed view). This eccentric rotates within and transmits an eccentric motion to arm *C* to which is attached an internal or wobble gear *D*. Gear *D* meshes with and drives pinion *E* to which is attached cam *F*. This cam has two working edges for operating followers *G* and *H*, as these followers require different motions.

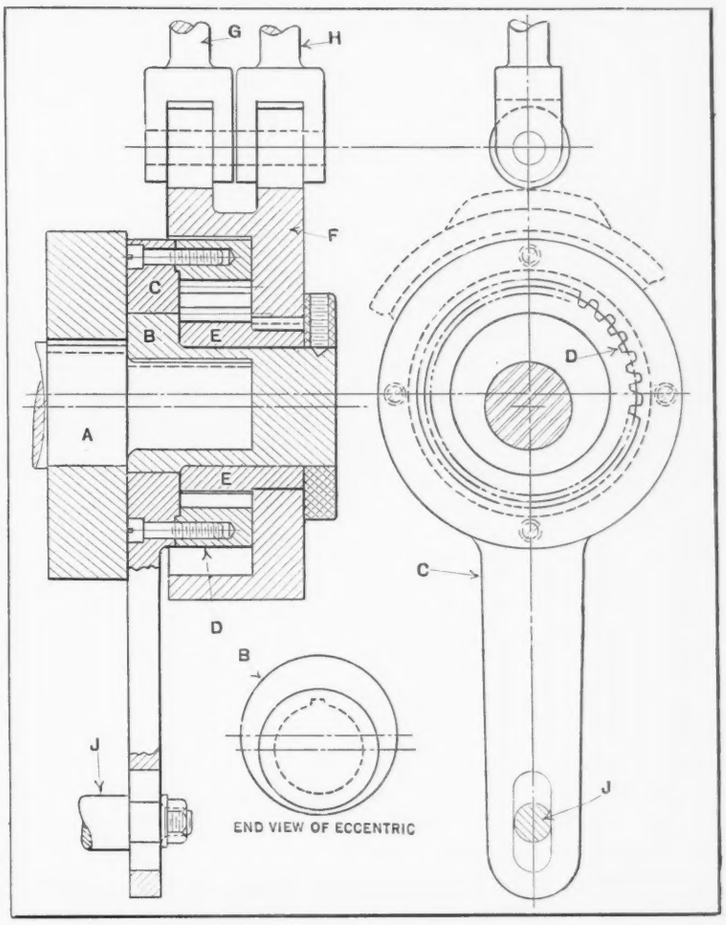
At the lower end of arm *C* there is a stud *J*. One end of this stud is fixed to the press frame and the other end engages an elongated slot in arm *C*, thus preventing the latter from rotating about its axis, but permitting the axis to rotate around a circle equal in diameter to the throw of the eccentric.

The action of the mechanism is as follows: When the press shaft *A* rotates in a right-hand direction, the driven pinion *E* revolves in a left-hand direction. In one revolution of shaft *A*, the rotation of pinion *E* is equivalent to four teeth, this being the difference between the numbers of teeth in internal gear *D* and pinion *E*. Gear *D* has thirty-two teeth and pinion *E* twenty-eight teeth and $32 - 28 = 4$; therefore, pinion *E* will make one revolution for every seven revolutions of the punch press shaft, which is the reduction required. The gears are of 8 diametral pitch and the eccentric radius is 1/4 inch, giving 1/2 inch throw. The gear teeth are modified somewhat to provide clearance for the eccentric movement.

All parts are made of machine steel. A 1/8-inch air hole (not shown) is drilled through part *B* opposite the end of shaft *A* to permit the air to escape when assembling *A* and *B*. The bearing surfaces also have suitable oil holes, which are not shown.

* * *

When automatic oxy-acetylene shape-cutting machines have been installed in a manufacturing plant for regular production operations, many incidental applications of the machines are usually found in making tools and accessory equipment. One instance of this kind was observed in a large plant in the Middle West that manufactures compressors. On these machines there is a large nut which is not accessible with the usual type of long-handled wrench, but requires a wrench of special design. These wrenches are produced easily and economically on the shape-cutting machine. Templets of various sizes to suit the wrenches for different compressors are kept in stock, and the wrenches are cut out from pieces of scrap plate of the proper thickness. The shape-cutting machine cuts the wrenches accurately to size, so that no additional machining is required. The wrenches are simply put in a tumbling barrel, which provides sufficient finish for all practical purposes.



Compact Speed-reducing Gearing for Operating Press Fixture

Current Editorial Comment

In the Machine-building and Kindred Industries

THE NEW COOPERATION IN INDUSTRY

A great change has taken place in the attitude of business toward competition in the last twenty-five years. In the past, competitors were looked upon with suspicion—in fact, some manufacturers did not want to meet their competitors at all. Everyone thought that his sales were obtained at the expense of his competitors' business. There was little or no conception of the idea that an industry as a whole could work together in a friendly way, and that competitors could be helpful to each other.

But this new idea has made great progress in recent years. Trade associations are now recognized as a medium through which those engaged in the same line of manufacture can cooperate. Most of the problems that confront competitors in any particular line of business are the same, and these problems can be solved more effectively by the industry as a whole than by each individual firm.

Research work is done on a cooperative basis. It is recognized that what is good for a whole industry is good for each manufacturer in that industry; and vice versa, what is bad for the industry in general will react unfavorably on each separate business. Only a temporary advantage can be gained at the expense of the industry as a whole.

* * *

ONCE AGAIN—THE CONVENTION PAPER

During the next two months a great many societies and associations in the mechanical field will hold their annual conventions. Aside from the contacts and acquaintances made at these meetings, their greatest value lies in the papers presented and in the ideas that those attending carry away with them.

However, the manner in which papers are read before many such gatherings leaves much to be desired; often the presentation is such that it is impossible for the audience to digest the contents. Theoretical papers with many formulas and charts should never be presented in full before a general convention meeting. It is far better to give a summary of the paper and present the main conclusions only, with a view to stimulating a general discussion that will bring out further information.

Few, if any, of those present are able to absorb the formulas and charts from the hasty reading of a paper. Those particularly interested in the details will be better served if copies are furnished that they can study at their leisure.

The time allotted to each speaker during the discussion of papers should be limited. An effective means of signaling speakers who find it difficult to be brief and concise in their remarks was adopted recently by a national society. Two electric bulbs —one red and one green—were placed on the speaker's table. When the time was nearly up, the green light would go on as a warning to the speaker; when the allotted time was exceeded, the red light would go on, definitely notifying him that he must bring his remarks to a close. As the audience could also see the red signal, the method proved very effective.

* * *

WHY NEGLECT CHUCKS AND VISES?

There are three chief mechanical factors entering into the efficiency of a machining operation—the machine tool, the cutting tool, and the tool- and work-holding devices. In recent years there has been an awakening to the fact that unless good machines and good cutting tools are used, the best results cannot be obtained; but the importance of the tool- and work-holding devices, especially the need of chucks and vises of modern design and capacity, is not so generally recognized. It is not the machine alone, nor the tool alone, that turns out good work. It is a combination of the entire equipment, including the chucks, vises, and other accessories by means of which the tool or work is held. It is simply another instance where the old saying about the chain and its weakest link applies.

Shop executives, generally, are well informed on newly developed machines and cutting tools, but they are not so closely in touch with the great developments that have taken place in recent years in the design and construction of tool- and work-holding equipment. The drill and lathe chucks of today, for example, while in outward appearance resembling those used in the past, are made from higher grade materials and incorporate new methods of design, making them more convenient to handle, stronger, and more reliable.

It will pay shop executives to look into this part of their equipment. Here is a chance for greater efficiency, and now is the time to do the replacement work necessary. When business is rushing again, there will not be sufficient time to give the matter thorough attention.

* * *

INDEX TO THE THIRTY-SIXTH VOLUME OF MACHINERY

The index to the thirty-sixth volume of MACHINERY, covering the year September, 1929, to August, 1930, is now ready for distribution. We will be glad to send copies to readers who desire to keep a permanent file of MACHINERY.

Is it the Foreman's Job to Train New Men?

The Need for More Thorough Training in the Industries is Recognized Foremen's Conferences are a Valuable Adjunct to This Work

By R. D. BUNDY

THE question may well be asked: In the rapid mechanical advance that has been made during recent years, have we kept pace with this development in the training of industrial workers for their jobs or is the new workman still left to learn the job as best he can? Can we afford to let him experiment, spoil a few pieces, perhaps damage the machine, and possibly injure himself?

Can we afford to let him learn by watching older workmen? Do we know that the older men do the work in the most efficient manner? If so, are all of our men using the best method? Does the older workman know how to teach the job to someone else? Does it make much difference to him whether the new man is taught or not? Whose fault is it when the new man does not make good? There are two possible reasons for his failure—the man who hired him may have made a poor selection, or the breaking-in process may have been so badly handled that the man became discouraged and quit.

R. D. Bundy

Does anyone believe that "if the job is presented to the new man in the proper way he will be able to turn out work immediately that will pass inspection?" Has the job been analyzed for the purpose of finding out what instruction is required?

Who is Responsible for the Training of New Men?

Who is held responsible for the training of new men? Invariably, the foreman. Does he actually do the training? Very seldom; he does not have the time. But before the new employe becomes a good worker, the foreman must take the time to straighten out the difficulties arising from poor workmanship. Probably this is the reason why he is so busy. It requires more time and worry to *get* out of difficulties than it does to *keep* out of them by teaching the new man how to do a good job in the beginning.

It is surprising how quickly a man can be broken in under a skillful teacher. When one sees a foreman take fourteen minutes to teach an entirely green man how to assemble a motor and the man then turns out his first motor complete, without a question or a mistake, in ten minutes, one has witnessed an exhibition of teaching skill. Twenty-four minutes of the foreman's time has produced a workman who can do the job. Moreover, the man's time for assembling his first motor was very close to the piece-work standard. Could the foreman's time have been spent more profitably?

All jobs cannot be taught in so short a time, but the principles involved apply both to the routine production job and to work requiring greater skill. When the foreman once acquires the technique of teaching a new man, he will find use for it in all phases of his job.

The instructor-foreman stands out as the key man in industry. He is the connecting link not only between the management and the men, but also between the industry and the public schools, especially the vocational trade schools. He uses the product of the schools, and is in a position to send the best material to the trade school.

The Place of Foremen's Conferences in the Industrial Training Scheme

In Cleveland, the relation of the foreman to vocational education has been recognized, and foremen's conferences have been included in the program of vocational education in that city. The work is sponsored by the Cleveland Board of Education in cooperation with the State and Federal Boards for Vocational Education. A conference leader who is experienced as an industrial executive is retained to carry on this work. Conferences are held in various plants, lasting one hour. The writer has held such conferences during the last six years, in forty of Cleveland's large industries, with approximately 1800 foremen, in groups of from fifteen to

Roy D. Bundy, industrial coordinator with the Cleveland Board of Education, was born in Indiana in 1887. He graduated from the electrical engineering course at Purdue University in 1910. He spent three years as foreman, four years as production manager, and seven years as assistant manager of the Cleveland Mazda plant of the National Lamp Works Co. While production manager in 1914, he conceived the idea of organizing the plant foremen into a club for the purpose of promoting production efficiency and cooperation through group discussions of plant problems. From these discussions, a systematic series of training conferences was developed. In 1924, Mr. Bundy became industrial coordinator in the vocational department with the Cleveland Board of Education. In this capacity, he leads foremen's conferences in forty of Cleveland's industries. In 1926, he obtained the degree of E.E. from Purdue University, and in 1930, the degree of A.M. from the Western Reserve University.

thirty. A number of the larger firms have decided on programs that will include all their foremen and assistant foremen in a conference group.

Occasionally one hears the owner of a plant say: "An outsider cannot come into my plant and tell my foremen anything." This is attacking the problem from the wrong point of view, because a man who can qualify as a conference leader will not even assume that the foremen need to be told anything. On the other hand, the leader enters the conference realizing full well that he can be told a great deal by this group of men. It is his problem to get them to tell him. He must be a good listener and a keen analyst. He presents the problem and guides the discussion in such a way as to bring out the underlying principles. The solution is obtained from the experience of the group itself. The problems discussed merely have to do with the various responsibilities of the foremen.

What is Expected of a Foreman?

An analysis of the foreman's responsibilities shows that a foreman must be a composite man—he must be a teacher, a salesman, a leader, an organizer, a business man, and a craftsman.

Is it possible to relieve him of the difficult part of the job? There is a great reservoir of information stored up in the experiences of each industry's foremen. If it is possible to tap this reservoir and use the information in the development of principles by means of which the foreman's problems can be solved, the job becomes comparatively simple. The difficulties assume smaller proportions, and the problem becomes easy, because it has been analyzed and the relation of the various elements to the job as a whole has been determined.

How can this be accomplished? Exchange of ideas is the forerunner of progress. It is through this medium that we add to our stock of knowledge, and often an entirely new thought emerges. The conference offers an excellent method of solving problems through the use of information contributed from the individual experiences of the men in the group. The solutions thus arrived at are acceptable to the foremen because the leader has encouraged them to think out the problem themselves, instead of endeavoring to instill ready-made opinions into their heads. "Ready-to-wear" ideas may or may not be remembered or believed. It makes little difference what industry the foreman is engaged in, his problems are similar to those of other foremen in the same organization and differ only in degree from those of foremen in other industries.

The most important question raised by the author of this article is: Who is responsible for the training of new men in the shop? There is no question but that the responsibility rests with the foreman. However, does he actually do the training? The author answers: "Very seldom, because he does not have the time." Emphasis is placed on the importance of teaching a new man how to do a good job from the beginning, because it requires more time and worry to straighten out the difficulties arising from poor workmanship than it does to prevent unsatisfactory work in the first place. A foreman cannot spend his time more profitably than in instructing new men properly so that they will perform their work in accordance with the requirements of the product being made. This saves trouble later.

What Factors Contribute to the Success of Foremen's Conferences?

The success of foremen's conferences is comparative and depends largely upon the amount of thought put into their organization. Some leaders may be satisfied with less than others, but a number of factors may be suggested that have proved effective in obtaining the greatest possible good from these conferences.

First, the meeting place should be in a quiet room where the men can smoke. It should be equipped with comfortable chairs and a blackboard.

Second, the group should not number over twenty-five men; fifteen is an ideal group, because it gives each member an opportunity to participate.

Third, the conference should be held during working hours. This is good psychology—therefore, it is good business. The foreman should be made to feel that the conference is a part of his regular job. Executives should make it a point to convey this thought to the group at the first meeting.

Fourth, the higher executives should keep posted on what is going on by attending the meetings or by reading the minutes. The writer prefers to have the higher executives sit in whenever possible.

Fifth, a secretary should be selected from the group to take minutes of the meeting. The selection of a man who can take good minutes is an important factor.

Sixth, three members of the group should be elected to serve as an executive committee, as it is a recognized fact that these conferences are not a one-man job. The greatest good will result if all participate. The executive committee assumes the responsibility of keeping this thought before the group. It selects a chairman for each meeting, encourages suggestions, contributes subjects for discussions at opportune times, and in a general way makes each participant feel that he has a definite responsibility toward the conference.

Seventh, the man who is to lead the conferences should have unquestioned ability. A poor leader will make a failure of conferences that otherwise would have succeeded. Good leaders have been known to make successes of these conferences under very poor conditions. Conferences poorly conceived may lead to disappointment.

An Executive's Opinion Concerning Foremen's Conferences

The following statements were made by a works manager to his foremen at the beginning of their

first conference: "These meetings are conducted in such a manner that we will obtain a better understanding of our job. Not only do we learn our own job, but through the contact with other men, we learn something of theirs. We find that they have problems requiring a great amount of thought, similar to our own.

"Foremen conferences develop cooperation. This factor is a great asset in carrying on the company's business. The word 'cooperation,' however, is greatly misused. It should not be confused with collaboration and coordination.

"In these meetings we learn what constitutes competent foremanship. We obtain a better appreciation of the successful characteristics of a foreman. Perhaps the most important one of these is leadership—men must be led, and we expect our foremen to follow this principle very closely.

"Foremen conferences provide an opportunity for the foreman to prove his status. It is an excellent opportunity to prepare for bigger things.

"Attendance at these meetings should be prompt and regular. The discussions cannot be read from the minutes. Every man must plan to come to these meetings on time. These conferences are one of the regular weekly jobs of each foreman."

In conclusion, it is well to repeat that the industrial foreman is a composite man—he must be a teacher, a salesman, a leader, an organizer, a business man, and a craftsman. If he is to function efficiently in all these capacities, he must understand the principles involved and acquire the technique necessary. Foremen conferences are being more and more accepted as a means of giving the foreman a new perspective—a better appreciation of the responsibilities and possibilities of his job.

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MEETING OF INDUSTRIAL ENGINEERS

The Society of Industrial Engineers will hold its seventeenth national convention at the Hotel Mayflower, Washington, D. C., October 15, 16, and 17. Some of the subjects to be discussed are as follows: "Coordinating Industrial America's Materials, Machines, and Men"; "The Status of Industrial Engineering in College Curricula"; "Stabilizing Industrial America's Purchasing Power"; "How the Federal Government is Organized to Profitably Help Industrial America"; "Present Status of Plant Maintenance"; "Present Status of Time Study Engineering and Wage Incentives." George C. Dent, 205 W. Wacker Drive, Chicago, Ill., is executive secretary.

The Care of Journal Bearings

There are a few simple rules to be observed in the care of journal bearings to insure freedom from bearing troubles. Too frequently, these rules are not observed, with the result that machines have to be shut down, production is interrupted, and needless expense incurred. An article to be published in October MACHINERY will outline the causes of overheated bearings, indicate the temperatures that should not be exceeded, give instructions as to what to do when one is unfortunate enough to have a "hot box," and give advice as to precautions to be taken in cooling overheated bearings. The effect of weather conditions on bearings will also be pointed out. Generally speaking, it is necessary to take greater precautions in summer than in winter to prevent bearing troubles.

A SANE VIEW ON THE BUSINESS OUTLOOK

Leonard P. Ayres, vice-president of the Cleveland Trust Co., is recognized as one of the outstanding analyzers of business conditions. Commenting upon conditions at the present time, Col. Ayres states that it is likely that July will prove the lowest point in the present business cycle and that from now on, business will improve. When statistics are available, business is likely to be shown to have been better in August than in July; and it will be better in September than in August. The automobile companies are planning to increase their output, and the steel companies have orders either on hand or ready to close that are sufficiently large to increase their production materially.

During the first half of this year, all statistical comparisons have been made between the figures of the early months of 1929, when business was advancing to boom proportions, and corresponding months of this year, when depression prevailed. During the second half of this year, such comparisons will make better showings; for, during that period of the year in 1929, business activity was rapidly shrinking, whereas, in the latter part of 1930, it is likely to be gradually advancing. These comparisons will, therefore, tend to improve the sentiment of business.

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AUTOMOTIVE ENGINEERS' PRODUCTION MEETING

The Society of Automotive Engineers will hold its annual production meeting at Detroit, October 7 and 8. There will be three technical sessions, together with one or more plant visits. The meeting will close with the usual production dinner held on the evening of October 8 at the Book-Cadillac Hotel, where the technical sessions also will be held.

The papers to be presented at the technical sessions will offer much of unusual interest. R. L. Templin, of the Aluminum Co. of America, will speak on "New Developments in Machining Aluminum and its Alloys"; W. H. McCoy, of the General Motors Corporation Research Laboratories, will read a paper on "The Use of Cemented Tungsten-carbide Tools"; J. C. Hough, of the Mathews Conveyor Co., will present a paper on "Design Elements and Economic Conditions of Material-Handling Systems from the User's Point of View"; E. J. Bryant, of the Greenfield Tap & Die Corporation, will speak on "Wear Allowances and Tolerances on Gages"; Paul N. Lehoczky of the Ohio State University will discuss "Economic Production Lots," and C. B. Jones of the Detroit School of Applied Science, "The Tool Engineer's Place in Mass Production."

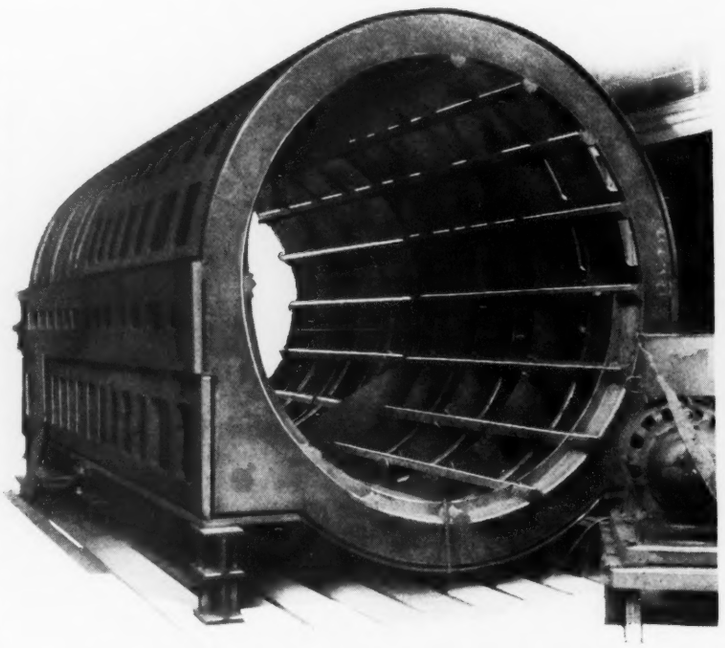
Notes and Comment on Engineering Topics

Thyrite, a New Material for Electrical Use—Micarta Airplane Propellers—A New Alloy for Pistons—How Skid Platforms Save Costs

An entirely new type of material that is both a good insulator and a good conductor of electricity has been developed by the General Electric Co. This material is called "Thyrite," and has the remarkable property of changing its resistance to the flow of electricity as the voltage is changed. This change in resistance is such that if the applied voltage is doubled, the resistance decreases so that the current flow is increased more than twelve times. This means that if the voltage is increased sixteen times, the current flow is increased more than 25,000 times. The change in resistance is as rapid as the change in the applied voltage. Tests have shown that the resistance can be decreased to a millionth of its original value in a millionth of a second.

Among other applications, the material is used, in the form of disks, for lightning arresters to protect power power stations against the damaging effects of lightning. These disks have a resistance of about 50,000 ohms when 100 volts are applied. The resistance decreases to less than 1/2 ohm when the voltage is increased to 10,000 volts. The material resembles black slate in color and can be molded to the shape required. Its mechanical properties are similar to those of dry-process porcelain. In manufacturing, the material is molded to the shape required and the contact surfaces are coated with metal by the metal spraying process.

An idea of the enormous size of the R-100, England's latest contribution to lighter-than-air navigation, may be had by comparing it with the *Graf Zeppelin*, the well-known German dirigible that made a successful trip around the world and recently visited South America and the United States again. The gas capacity of the English dirigible is 5,000,000 cubic feet, while that of the German aircraft is 3,750,000 cubic feet. The *Graf Zeppelin* can carry 20 passengers and a crew of 30, while the R-100 is able to carry 100 passengers with a crew of 40 and still has space for 10 tons of freight or mail. It is provided with six Rolls-Royce Condor 700-horsepower motors—the largest amount of power ever applied to an airship. According to the American Cable Co., more than twenty-two miles of wire rope were employed in the construction of the hull of the R-100.



Turbo-generator Stator, Over 18 Feet Long, Made by the Westinghouse Electric & Mfg. Co. Entirely from Welded Steel Plate

The story of the rise of the machine age will be told in a special educational exhibit to be held from September 12 to November 15 by the Museums of the Peaceful Arts, 220 E. 42nd St., New York City. Almost one hundred nationally known firms have cooperated in the assembling of this special exhibit, work on which has been under way for more than five months. In effect, the exhibit will show the rise of western industrial civilization since 1780. Many of the machines will be in operation, manufacturing articles used in everyday life. One of the objectives of the exposition is to emphasize the growth of metallurgical science, and the development of power equipment and machine tools.

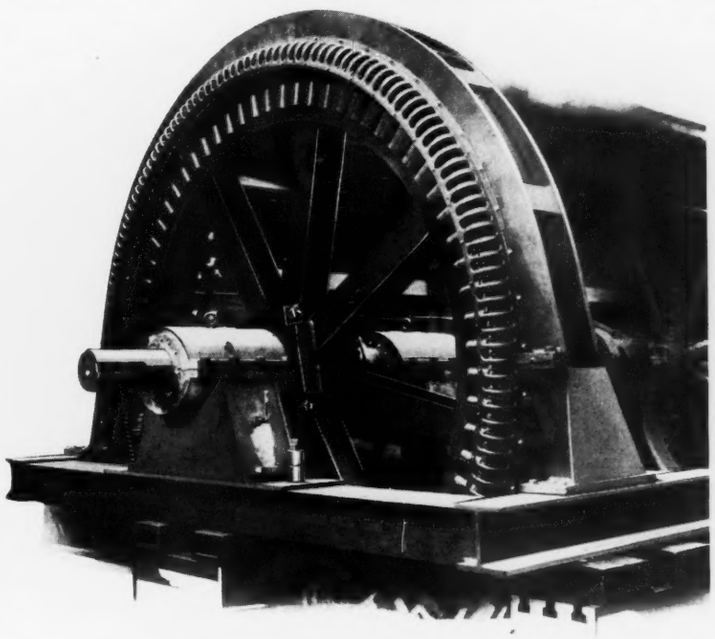
It is of interest to note that the propellers of the giant trans-Atlantic plane, the *Southern Cross*, in which Major Kingsford-Smith and his crew flew over the Atlantic from Ireland to Roosevelt Field, Long Island, were manufactured of a material made principally from cotton. These airplane propeller blades were made from the material known as Micarta which, in turn, is made from ordinary canvas compressed into a non-corrosive product of metallic strength. Micarta propellers were developed by the Westinghouse Electric & Mfg. Co. An article describing the manufacture of Micarta propellers appeared in MACHINERY, February, 1929, page 409.

Special sixteen-wheel railroad cars, 56 feet long, equipped with ladles for transporting molten metal, are used between blast furnaces at Hamilton and open-hearth furnaces at Middletown, Ohio. As they weigh 340 tons fully laden, the tracks and bridges over which the run is made are of extra heavy construction. According to *Compressed Air*, these cars carry the heaviest load ever handled on a railroad car. The time consumed in making the run between these points—a distance of ten miles—is one-half hour. This method of shipping the iron is found preferable to that of delivery in the form of pigs, as the iron remains hot for forty-eight hours.

The past year has witnessed the adoption of a new aluminum piston alloy by some of the leading manufacturers of aircraft, automobile, bus, and marine motors. This alloy, developed by the Aluminum Co. of America as No. 132, and commonly known in the trade as "Lo-Ex" (meaning low expansion), constitutes the first outstanding improvement in piston materials since the introduction fifteen years ago of the aluminum alloy containing 10 per cent copper and a small percentage of magnesium. The new alloy, with approximately 14 per cent silicon and varying amounts of nickel, copper, and magnesium, has a much lower coefficient of expansion, better thermal conductivity, and superior bearing qualities. Its specific gravity is substantially less than that of the aluminum-copper alloy and about equal to that of pure aluminum. As a result of this combination of properties, pistons cast in No. 132 alloy can be fitted with closer clearances, form less carbon, and have a greater resistance to wear.

According to Lloyd's Register of Shipping, the total tonnage of merchant vessels exceeding 100 tons gross, launched in 1929 throughout the world, was greater than in any year since 1921, amounting to 2,793,210 tons. Of this, 1,522,623 tons were built in Great Britain and 126,063 tons in the United States. Germany built the largest tonnage next to Great Britain. Holland and Japan came next to Germany. The largest ship launched during the year was the British motorship *Britannic*, of 26,840 tons.

Railway cars running apparently without the aid of human agency will transfer cement rock from the excavating pit to the crusher on a railway haulage system to be built by the Trinity Portland Cement Co., of Dallas, Texas. A novel system of remote control devised by the General Electric Co., will govern the operation of the cars. With this system, two operators, located where they can view the loading and unloading of the cars and their movements, can govern practically all the operations of the cars. Four motor-driven cars pass over the track, each propelled by two 50-horsepower squirrel-cage motors. The cars are stopped and started by remote control, and electric solenoid brakes, operating automatically as soon as the current is turned on or off, will stop the cars when the energy supply is interrupted. The direction of travel is also changed by merely throwing a switch.



All-arc-welded Frame for a Large Synchronous Generator Fabricated in the Shops of the Westinghouse Electric & Mfg. Co.

According to an article in the *Purchasing Agent*, one of the western railways reduced the labor payroll in the storekeeper's department over $15,000 a month by the use of skid platforms and lift trucks. In the handling of brake-shoes, 175 manual operations were reduced to 7, and in handling brake-beams, about 200 operations were reduced to 10. An automobile manufacturing company reports that the old method of unloading a car of crankshaft forgings required eight men at a cost of $24. It was found that, by means of skid platforms and lift trucks, two men could unload a car at a cost of $1.

"The use of an incentive plan for employes tends to improve rather than to deteriorate the quality of the work," said William H. Bray, superintendent of methods and betterments of the Automatic Electric, Inc., before the American Management Association at its recent meeting in Cleveland. This applies equally to manufacturing, clerical work, and inspection. The rates, of course, must be set to allow the operator sufficient time to perform quality work and still earn a good wage. Furthermore, the incentive plan must be based upon predetermined standards of quality, and failure to meet these standards should carry with it a penalty, the same as good performance carries with it a bonus. Any bonus system based on these principles, properly administered, is likely to prove successful.

The Stevens Hotel on Michigan Boulevard in Chicago where the Exposition will be Held

The National Metal Congress and Exposition

Chicago, September 22 to 26

Four National Societies Join in Making the Steel Treaters' Annual Convention an Outstanding Engineering Event

THE 1930 National Metal Congress and Exposition, to be held in Chicago during the week beginning September 22, promises much of unusual interest to visiting engineers and metallurgists. There will be thirty-one separate technical sessions on the program. The American Society for Steel Treating, the American Society of Mechanical Engineers, and the American Welding Society are each devoting eight sessions to the presentation of technical papers, while the American Institute of Mining and Metallurgical Engineers will have seven sessions.

All the meetings, except those of the American Welding Society, will be held at the Hotel Stevens, where exhibition halls are also available for the exhibits of the one hundred and seventy-five firms that will show their products. The American Welding Society will holds its meetings in the Congress Hotel, within a short distance of the Hotel Stevens.

The exhibits will be open only two evenings during the week, instead of three as in the past. This change has been made in order to meet the wishes of the representatives of the cooperating societies, leaving the evenings free for technical sessions. Under the present arrangements, therefore, the exposition will be open from 10 A. M. to 6 P. M., Monday, Wednesday, and Thursday, September 22, 24, and 25; on Tuesday, September 23, and Friday, September 26, the exhibits will be open from noon until 10 P. M.

The Program of the American Society for Steel Treating

The American Society for Steel Treating, which sponsors the Congress and the Exposition, has scheduled sessions on corrosion-resisting metals, nitriding, forgings, steel melting, and carburizing. In addition, there will be two sessions devoted to miscellaneous topics, and a third to papers dealing with advanced metallurgy. The Campbell Memorial Lecture, which will be delivered this year by M. A. Grossmann, vice-president of the Republic Research Corporation, will be on "Oxygen in Steel."

It is difficult to select from the thirty-three papers to be presented those that would be of greater interest than the rest to those responsible for machine shop production, as all of them are closely allied to machine shop work; but it is quite certain that the following papers will be of especial interest: "Stresses and Cracks in Hardened and Ground Steel"; "Cold-heading Die Life"; and "Recent Developments in Gas Carburization." In addition, the papers on nitriding will command the interest of machine shop men.

The American Society of Mechanical Engineers will Stage Shop Practice Meeting

The sessions of the Machine Shop Division of the American Society of Mechanical Engineers will be held Tuesday, September 23, at 2 P. M. and 8 P. M., and Wednesday, September 24, at 10 A. M. and 2 P. M. Wednesday evening there will be a joint dinner of the Machine Shop Division, the Iron and Steel Division, and the Chicago Section of the American Society of Mechanical Engineers.

The first session will be devoted to plastic materials, with papers on "Phenol Resinoid Molding" and on "Production of Plastic Telephone Parts." A session on machine tool motors will deal with the flange type of motor mounting and with the mechanical design of electric motors as regards standardization and interchangeability. A session on nitriding will offer papers on the physical properties and adaptability of nitrided parts and on case-hardening with ammonia gas. At still another machine shop practice session, papers on automatic polishing and on the repair of worn parts by electrodeposition of iron will be presented.

Welding Society Plans Extensive Program

The impressive program planned by the American Welding Society includes discussions on tests for welds—tensile, bend, shear, impact, and fatigue—the examination of welds by X-rays, welded steel bar joists, the cost of welding, welding of stainless steel, and arc-welding of aluminum.

Furnaces for the Carburizing Department

New Developments in Carburizing Methods Produce Unusual Wear-resisting Qualities—Description of a Modern Heat-treating Department

By J. B. NEALEY

THE life of carburized parts subjected to wear, such as gears, cams, rollers, etc., is usually in direct proportion to the depth and uniformity of the case, other things being equal; hence, any method that will produce a uniform and deep carburized case will, in general, lengthen the life of the part so treated.

A method for carburizing steel parts to depths of from 3/16 to 1/4 inch has been developed and is used by the Tool Steel Gear & Pinion Co., Cincinnati, Ohio. Some remarkable results have been obtained through the use of a carburizing compound that was developed in the laboratories of this company. A uniform hardness is said to be obtained throughout the depth of the case, instead of the usual progressive tapering off from high- to low-carbon steel. Thus, the wearing qualities of a part so treated remain equally good until the carburized case has been entirely worn off to the full depth.

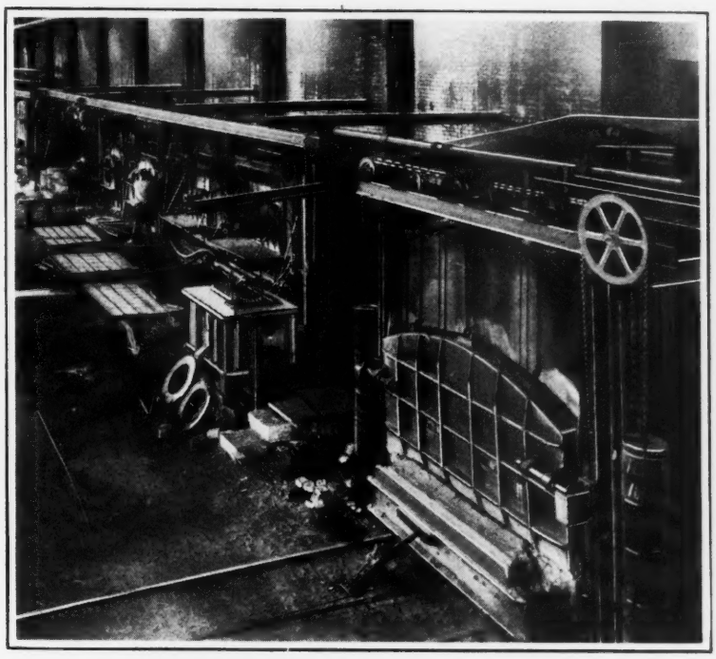


Fig. 1. General View in the Heat-treating Department at the Plant of the Tool Steel Gear & Pinion Co.

The Tool Steel Gear & Pinion Co. manufactures gears and pinions up to 80 inches in diameter, weighing as much as 3000 pounds each. Many of these large gears are employed for severe duty in steel mills, coal mines, cement mills, and for electric railway equipment; the carburizing process is also applied to such products as rolls for steel mills. For example, sheet leveler rolls for sheet steel mills hardened by this process produce a very high finish because of their smoothness and uniform hardness. Some of these rolls have been used continuously for five years without dressing or grinding. In the past, the average life of these rolls was only six months. Crane track wheels with hardened treads last from eight to ten times as long as those made from ordinary steel; and carburized gears have been found to wear from seven to ten times as long as untreated gears, and at least twice as long as wear-resisting gears made by other methods. This indicates that a real advance has been made in carburizing procedure.

While various kinds of alloy steels are used by this company in the manufacture of its product, by far the greater part is made from 0.15 to 0.20 per cent carbon steel. After carburizing, the hardened surface contains from 0.90 to 1.20 per cent carbon, and the hardness of the surface ranges from 90 to 100 on the scleroscope.

Furnaces and Equipment for Heat-treating

The heat-treating department of this company is unusual in size, and work of large dimensions can be handled. Most of the furnaces are located along one long side wall, with a quenching tank in front, and are served by a 5-ton traveling crane of 45-foot span, running the entire length of the building. Most of the larger furnaces are of the car-bottom type, and can be used interchangeably for carburizing and other heat-treatments. In all, there are sixteen large furnaces of heavy brick construction. The fuel used throughout is gas, this selection having been made, the company states, because of the economy, the uniform heating characteristics, and the ease of temperature control and of furnace atmosphere control possible with gas.

The first of the furnaces in the line is 12 feet deep, 9 feet wide, and 8 feet high, and is encased in steel plates. Heat is supplied from four gas-blast burners on each side—eight in all. Separate combustion chambers are provided for these burners in the shape of refractory lined steel boxes about 3 feet square. These are located along the two sides of the furnace at the bottom, and are entirely closed off from the heating chamber. Heat rises through flues in the furnace wall, and is admitted through openings at the spring-line of the arch.

Air is supplied to the furnace at 1 pound pressure, and gas at a pressure of 4 ounces. The gas to air ratio is regulated by a two-valve control. In the front of the furnace there is one large door, counterweighted, through which the cars with the packed boxes for carburizing pass in on tracks. The tops of the cars are made of refractory material and the edges form a seal with the furnace walls to prevent the heat of the furnace from descending into the compartment below, where the wheels and under-carriage are. The cars are pulled by a winch. The packing of the boxes takes place in a separate room at one end of the building, and the boxes are transferred to the cars by a crane.

The next two furnaces are practically alike—16 feet deep, 12 feet wide, and 10 feet high. They are of the double-arch type, the lower arch being perforated to allow the heat from the gas burners, which fire between the arches, to radiate on the work below. There are three burners on one side and two on the other, firing against the lower side of the upper solid arch, which is brought to incandescence. It is the heat from this arch that is radiated down through the openings in the lower arch. These furnaces are also of the car-bottom type, with tracks and a single door in front. The door, when closed, is held tightly to the front walls by cams to prevent the escape of heat.

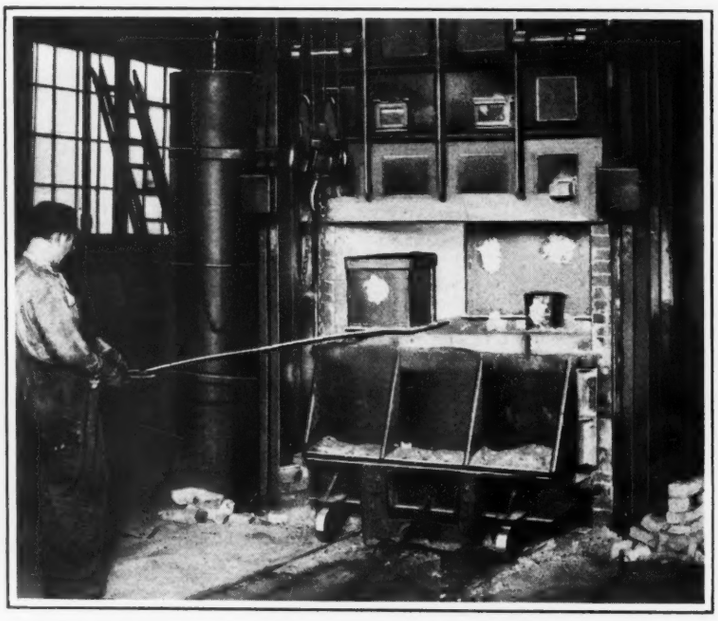


Fig. 2. One of the Latest Types of Car-bottom Gas-fired Furnaces

Next in line follow four furnaces 14 feet deep, 8 feet high, and 8 feet wide. These are also of the car-bottom type and of double-arch construction, being heated in the same manner as the furnaces just described.

The next four furnaces, each 8 feet deep, 8 feet wide, and 5 feet high, include, as a special feature, a method of underfiring a stationary hearth built on piers. Two gas burners on each side—four in all—are used. A portable charging platform, level with the hearths, serves these furnaces, as well as an overhead monorail conveyor with an electric hoist.

Recently, a new furnace, as shown in Fig. 2, provided with some unique features, was installed. It is built from brick, steel encased, and heated with six gas-blast burners, three on each side. It is of the car-bottom type, 9 feet wide, 14 feet deep, and 10 feet high. The hearth is an entirely new idea, the top of the car being of refractory material, with piers; on the top there is a series of rails with notches at close intervals. In these notches rest alloy steel tubes which support the work. The burners fire under these tubes. There is one large door in front and, when closed, this is locked tightly against the front wall by a cam on each side.

The department, of course, includes also the required water and oil quenching tanks, and two oil-drawing baths, heated by a single burner which fires tangentially to the inside of the circular furnace brick wall, thus producing a radiant heat. There are also smaller furnaces of different types used for various classes of heat-treatments.

* * *

A new alloy to be used as a substitute for pure lead in making water pipes and sheets is described in the monthly bulletin of the Anglo-Oriental Mining Corporation, Ltd. The new alloy, said to have been discovered by the British Non-Ferrous Metals Research Association, consists of 98.25 per cent lead, 1.5 per cent tin, and 0.25 per cent cadmium.

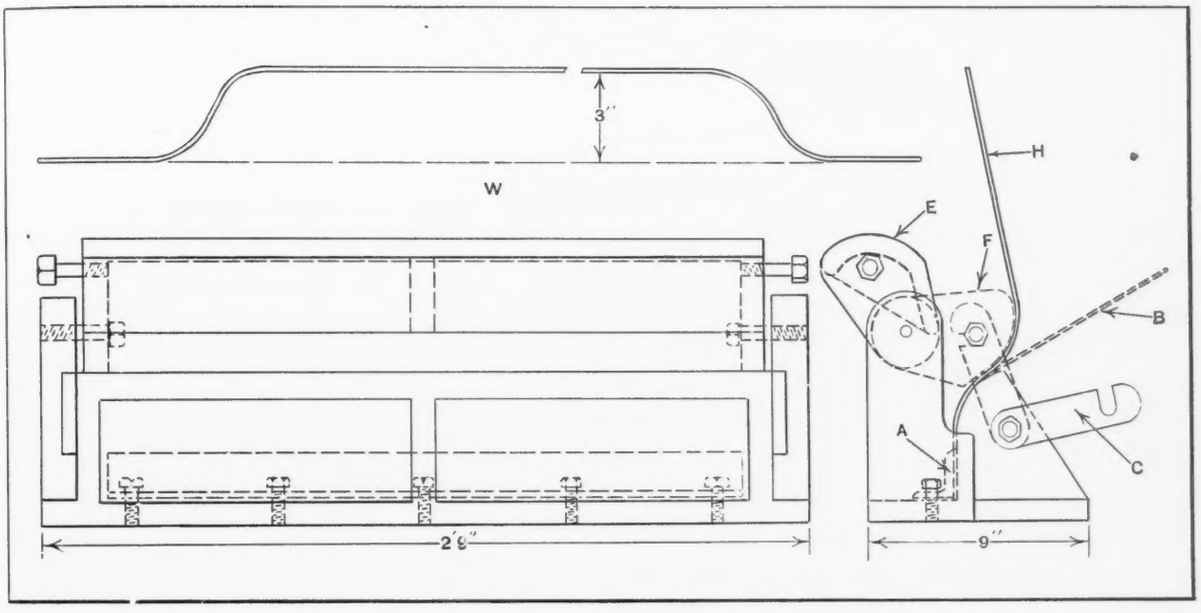
The strength of this alloy is so much greater than that of pure lead that pipes and sheets made from it do not have to be made so heavy for the same strength. In fact, the ultimate strength of the alloy is said to be 84 per cent greater than that of pure lead, and its resistance to vibration and bending is over 200 per cent greater. Pipes made from it, therefore, will be cheaper, for they need be only two-thirds the weight. While the new alloy will cost 10 per cent more per pound than lead, it is evident that the total cost for pipe of equivalent strength will be less; and while there is an additional manufacturing cost, the net savings still make the alloy pipe cheaper. Transportation charges will also be less on account of the reduction in weight. In ability to resist corrosion, the new alloy is stated to be as good as, and sometimes superior to, lead.

* * *

Students at the Boeing School of Aeronautics, Oakland, Calif., are being taught how to make parachute jumps from an airplane without leaving the ground. The student simply puts on a parachute and opens it out in an air stream to learn the proper handling of the ropes.

Special Tools and Devices for Railway Shops

Equipment Employed in Locomotive Repair Shops, Selected by Railway Shop Superintendents and Foremen as Good Examples of Labor-saving Devices



Bending Fixture for Forming Double Curves in Sheet Steel

SHEET-STEEL BENDING DEVICE USED IN RAILROAD SHOP

By A. EYLES, Moston, Manchester, England

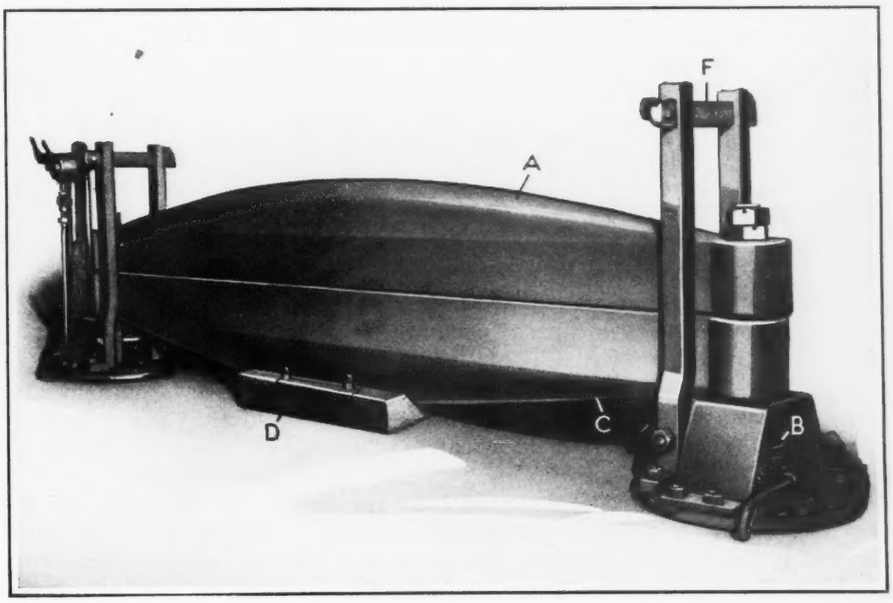
The bending device shown in the accompanying illustration is constructed principally of cast iron and is used for forming steel sheets 3/32 inch thick to the shape indicated at *W*. One end of the sheet to be formed is placed in the slot *A*, after which the metal is worked or bent over until it is in the position indicated by the dotted lines at *B*. The top portion *E* of the device is then brought over to the point indicated by the dotted lines at *F* and firmly secured by the fastening links *C*. The sheet steel is now worked over the forming member into the position indicated at *H* in order to complete the double curve, after which it is removed from the fixture.

The other end of the sheet is handled in a similar manner, thus completing the double curves at each end of the piece as shown in the illustration.

PNEUMATIC PRESS FOR FORMING SHEET METAL

By H. H. HENSON, Foreman, Machine and Erecting Shop, Southern Railway Co., Chattanooga, Tenn.

In the accompanying illustration is shown a pneumatically operated press which has proved of great value in a plant manufacturing steel railroad



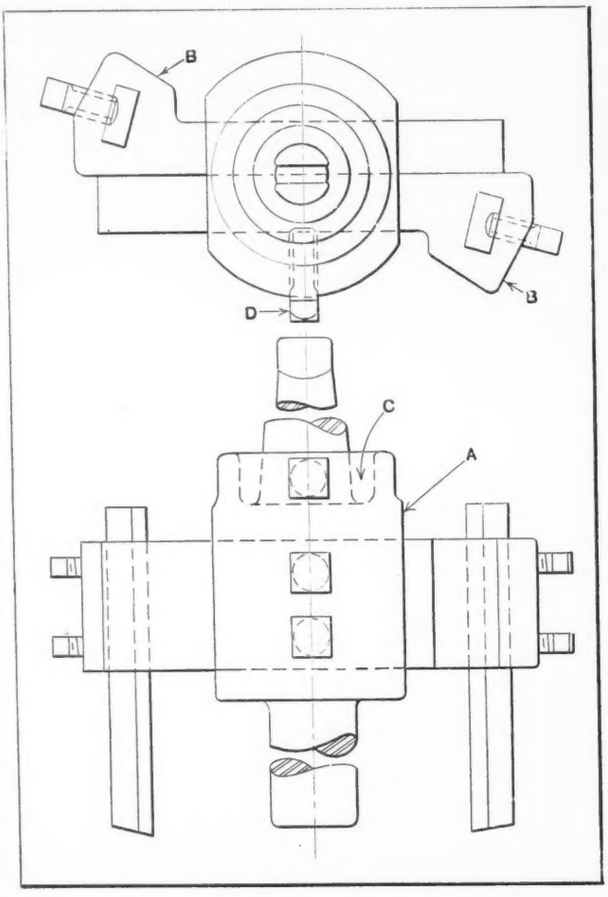
Pneumatic Press in which Long Beams are Provided for Bending and Straightening Wide Sheets of Steel

cars. It is employed for forming wide metal sheets and straightening them to suit the requirements. The machine is composed mainly of nine members: Two beam clamps *A* and *C;* two air cylinders *B*, operating the upper beam clamp; two pistons and their rods; two cylinder supports; and a three-way air valve.

The cylinders are 16 inches in diameter and 36 inches long. They may, however, be made any desired length. The piston-rods are 2 3/8 inches in diameter. The cylinders *B* are located in concrete pits in the ground in order to reduce the overall height of the machine. These pits are large enough to be accessible for connecting the pipes to the bottom heads of the cylinders.

To actuate the upper beam clamp *A*, air is admitted to the ends of the cylinders by means of a three-way rotary valve. The bottom beam clamp *C* is stationary and is secured by anchor bolts to the concrete base *D*. Thus, the machine rests upon three concrete supports, providing great rigidity. Two stops *F* limit the vertical movement of the upper beam to about 8 inches. If it is required to raise the beam clamp higher than this, the stops may be removed.

The surfaces of both beam clamps are planed parallel with each other so that an accurate job can be done. The clamps may be made of either steel or cast iron, depending on the rigidity required for the class of work to be done.



Trepanning Tool which May be Adjusted to Cut Numerous Diameters

ADJUSTABLE TREPANNING TOOL

A tool that has proved of great value in the locomotive machine shop for cutting holes in locomotive connecting-rods and making sheet-metal disks of various shapes is shown in the illustration. It is so constructed as to cover a large range of diameters.

In the holder *A* is cut a square hole through which the arms *B* pass, the latter being securely clamped in position by means of two set-screws. A tool bit is fastened in the end of each of these arms by set-screws and is easily removed for grinding. The shank of the holder is tapered to fit the hole in a drilling machine spindle or a milling machine, as the case may be.

The lower end of the holder is provided with a pilot bar which passes through a hole drilled in the work in order to support the tool during the trepanning operation. The pilot may also enter a pilot bushing secured in the machine table. This particular holder was designed with a recess *C* in which the end of the spindle sleeve enters. The set-screw *D* was added to prevent the holder from dropping out of the spindle. H. E. N.

* * *

The value of industrial statistics was well exemplified in connection with data collected and distributed by the Department of Commerce. A building supply company, in negotiating for its yearly contract for cement, was urged to make a quick purchase before the development of a shortage. A study of the business statistics given in the *Survey of Current Business* indicated to the officials of the company that cement stocks were 1,500,000 barrels greater than the year before, and that, therefore, prices actually seemed to be on the decline. Noting further that 300,000 freight cars were recorded as being idle against a shortage of 68,000 cars the year before, the company concluded that the railroads could be counted upon to deliver their purchases promptly. The use of these facts, made available through industrial statistics, enabled the building supply company to save 30 cents a barrel on a large order of cement.

* * *

FIFTY YEARS OF ENGINEERING SERVICE

A very attractive book entitled "The Warner & Swasey Company, 1880-1930" has been published by that company to commemorate the fiftieth anniversary of its founding. The book contains brief outlines of the lives and achievements of Worcester Reed Warner and Ambrose Swasey, the founders of the company, as well as of a number of their former associates. It also contains special articles by the present officers of the company on subjects pertaining to the products for which it is so well known.

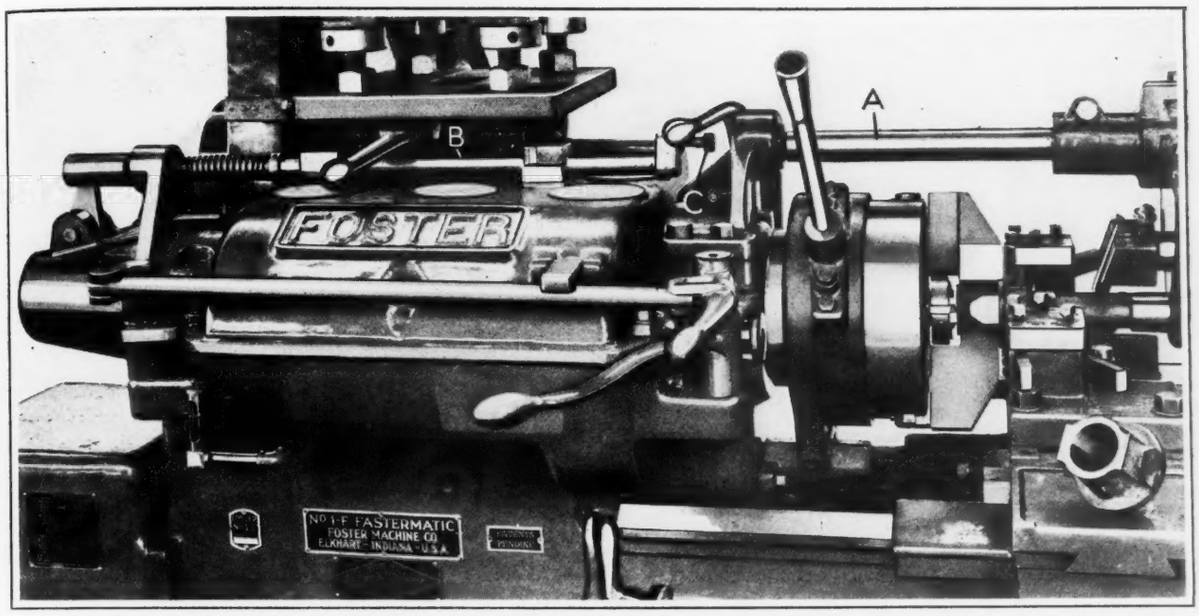


Fig. 1. Lathe Set-up Showing how Back-facing Attachment is Used

Rapid Lathe Operations in a Tractor Plant

By I. F. YEOMAN, Foster Machine Co., Elkhart, Ind.

BECAUSE of the ease with which automatic lathes can be adapted to various jobs by employing suitable attachments—usually of simple design—these machines are now widely used to obtain increased production. Moreover, cost estimating on lathe work has been greatly simplified by their use, inasmuch as their automatic features have eliminated the human element to a great extent.

One manufacturer of tractors employs two types of Fastermatic automatic lathes built by the Foster Machine Co. of Elkhart, Ind. In order to make clear the operations to be described, a brief description of these machines will be given.

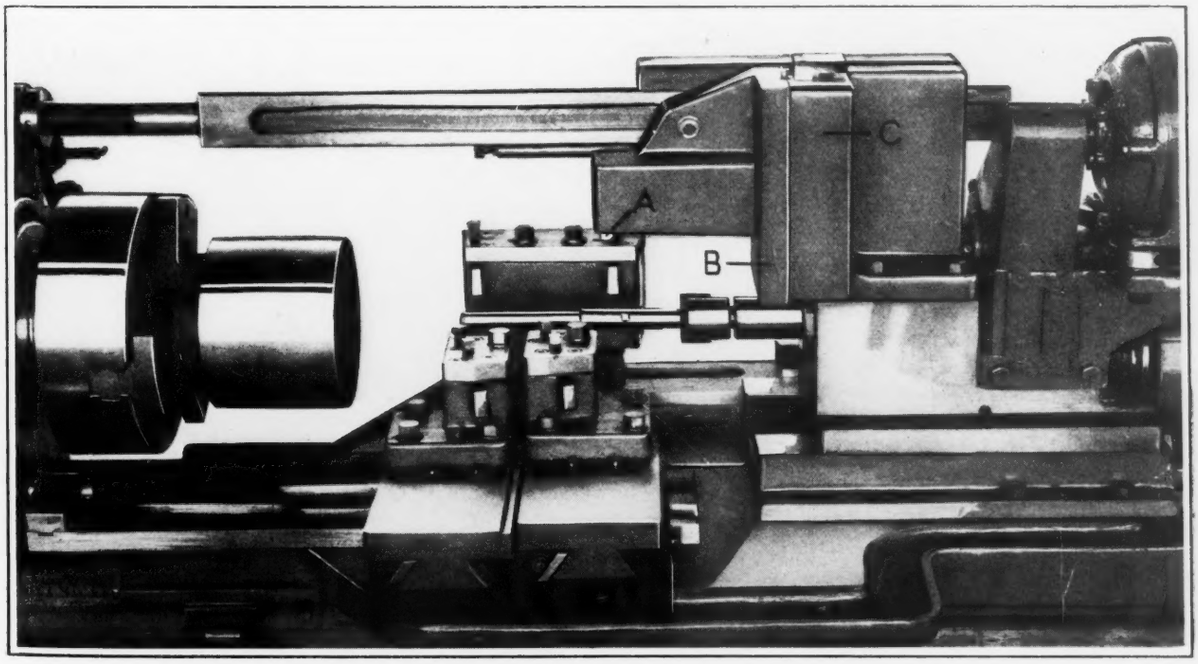


Fig. 2. A Rotary Boring-bar is Employed to Compensate for the Difference in Surface Speed between the Bore and the Pulley Face

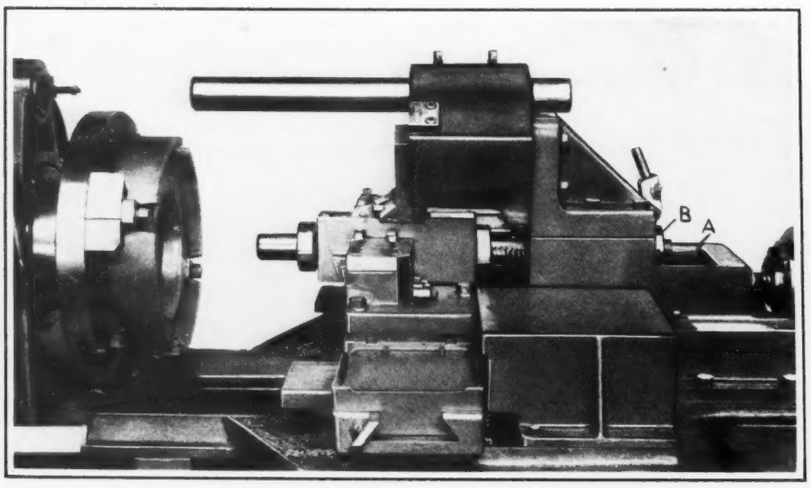


Fig. 3. Set-up Showing Spherical Boring Attachment which Operates Automatically

In the platen type machines, the movements of the platen and tool-carrying slides are obtained through two hydraulic rams, while in the turret type machines, the movements of the hexagon turret and cross-slides are effected by a sliding ram. Pressure is transmitted to the rams through the medium of oil, and different feeds are obtained by varying the volume of the oil.

All feeds are controlled automatically by cams which regulate the amount of oil actually pumped. In the turret type machine, the volume of oil is regulated for each face of the turret through a series of six cams timed to operate in relation to the six faces of the turret.

The cams can be adjusted to give a rapid traverse to or away from the work, as well as at any time during the feeding movement. The latter feature is especially desirable when the cutting tool must pass over a gap along the work before continuing the cut. These automatic features operate only during each cycle of operations, at the end of which all feeding movements stop to permit the loading of another piece of work.

To maintain stability of feeding movements, as is required for intermittent cuts, oil pressure is supplied to each side of the piston operating in each ram. The action here is similar to the ordinary differential movement.

Lathes of the platen type are so termed because the main tool-carrying member consists of a flat plate which slides on the machine ways. Longitudinal movement is imparted to this plate by means of a hydraulic ram similar to those already mentioned. Another ram may be mounted in various positions on this plate to operate auxiliary tool-slides or attachments.

In the turret type of lathe, the turret is indexed and clamped automatically by mechanical means; a feeding movement is imparted to the cross-slides through the action of flat cams secured to the turret-slide.

Special Back-facing Attachment Eliminates Rechucking

All roughing and finishing operations on clutch shifter rings in the plant mentioned are completed in one setting in a Fastermatic of the turret type. As shown in Fig. 1, the piece is mounted in a Foster-Barker chuck, the jaws of which are operated by a single lever, thus permitting rapid loading and unloading of the work. The hexagonal turret carries a duplicate set of tools, only three stations of the turret being required to carry the tools necessary to complete the operations.

The ring is rough- and finish-bored and then reamed; next, the end toward the turret is faced,

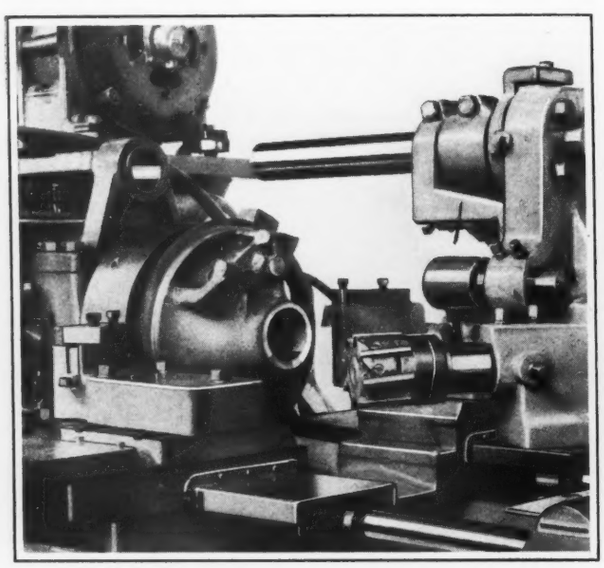


Fig. 4. Machining a Tractor Housing with Two Sets of Tools in the Turret

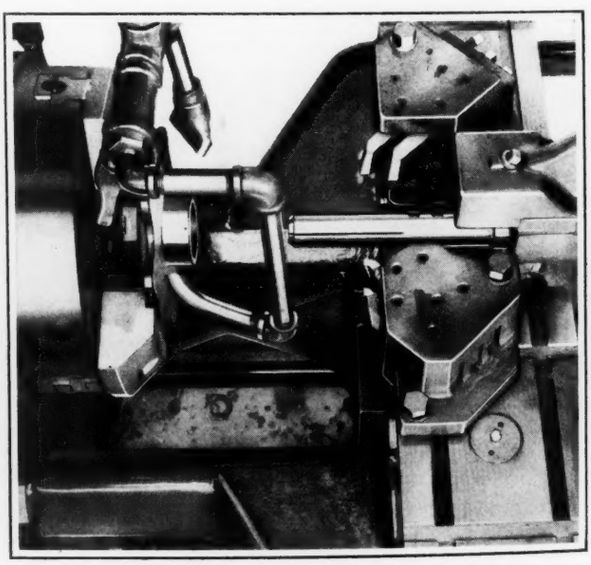


Fig. 5. All Operations Performed in this Set-up are Completed in Four Minutes

after which the flange is faced. Back-facing and chamfering the end of the bore nearest the chuck is done with a cutter similar in shape to that of a face mill. This cutter is located directly behind the ring and is mounted on a shaft extending through the spindle.

A longitudinal feeding movement is imparted to the cutter by means of the pilot-bar *A*, the end of which comes in contact with the adjustable screw *C* on the sliding bar *B*. A rocker arm, pivoted in a special bracket at the outer end of the spindle bearing, is engaged at one end by the sliding bar and at the other end by the cutter shaft, so that as bar *B* moves to the left, the cutter is fed against the end of the ring.

The cutter blades have projections toward the center which are shaped to chamfer the end of the bore simultaneously with the facing operation. Indexing of the turret and all feeding movements of the cutting tools are automatic. The floor-to-floor time for this ring is 3 1/2 to 4 minutes.

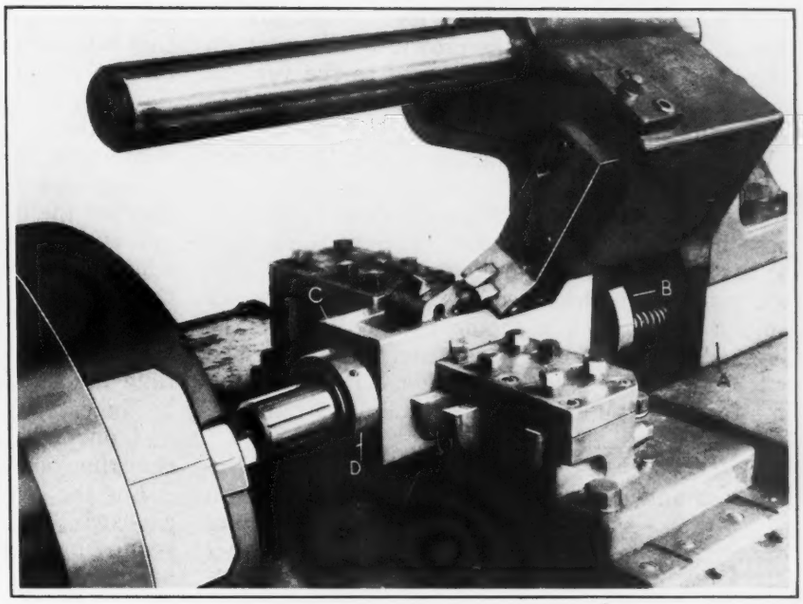


Fig. 6. Close-up View of Set-up Shown in Fig. 3

Rotary Boring-bar Compensates for Differences in Surface Speeds between Bore and Face of Pulley

All turning and boring operations on cast-iron tractor belt pulleys are performed in a Fastermatic of the platen type. The set-up for this operation is shown in Fig. 2. The pulley, which is 10 inches in diameter, is gripped internally by a three-jaw pneumatic chuck. The crown is roughed by the tooling on the front cross-slide. This tooling is carried rapidly to the working position by the lateral movement of the platen.

Both front cutter-slides are fed into the work by the action of stationary cams attached to the head end of the machine; each of these cams corresponds to the contour of each side of the crown, one cam being provided for each cutter-slide. The tooling of the forward slide starts turning at the center of the pulley, and the tooling of the other slide at the outer edge. A feeding movement of only half the width of the pulley is required to complete the rough-turning operations. The lateral feeding movement of the slides is obtained entirely through the movement of the platen.

A special attachment is employed for finishing the crown. This attachment, operated by a separate ram, consists chiefly of a flat grooved cam fastened to the headstock, and a tool-slide *B* sliding on the vertical bracket *C*. In the cam groove rides

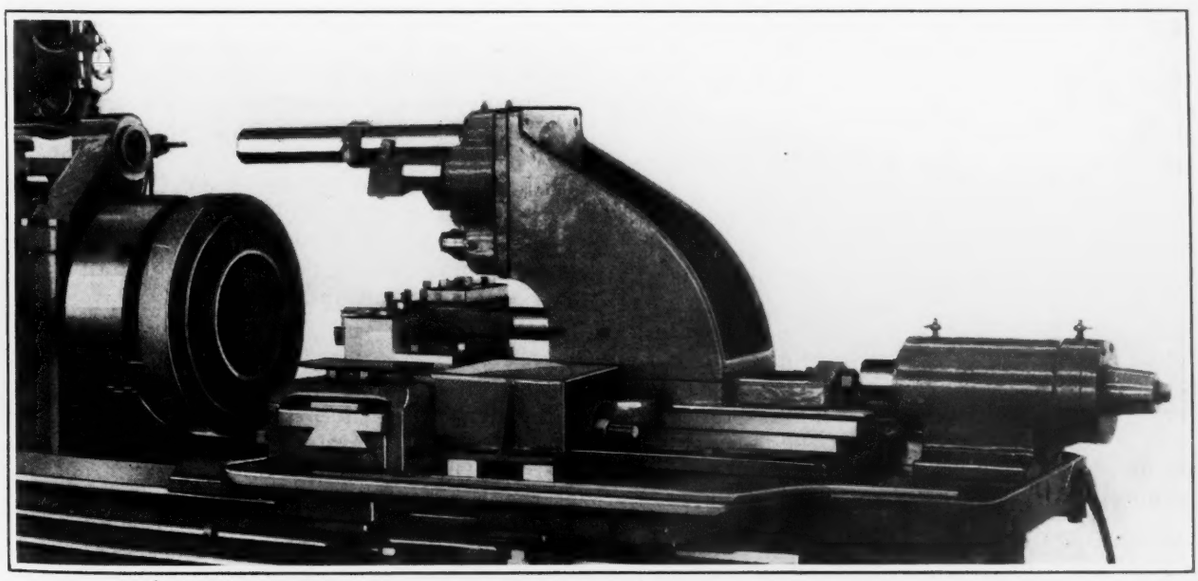


Fig. 7. Tooling Arrangement for Machining the Flywheels Shown in Fig. 8

a roll secured to the tool-slide. As this cam groove has the same contour as the crown to be turned on the pulley, the tool bit *A*, fastened in the vertical slide, will follow the path of the groove and produce the required crown.

While the crown is being machined, the boring-bar is passing through the bore of the pulley. In order to compensate for the difference in surface speed between the bore and the face of the pulley, the bar is revolved at a predetermined speed. This rotary motion is imparted to the bar by means of a chain drive from a motor mounted above the platen. All the remaining operations are performed by tools held in the rear cross-slide. The machining time for these pulleys is approximately 9 minutes.

Spherical Boring Attachment Operates Automatically

An example of spherical turning is illustrated in Fig. 3, where a differential housing is shown being bored in a lathe of the platen type. The tools used in this operation may be more clearly seen in Fig. 6.

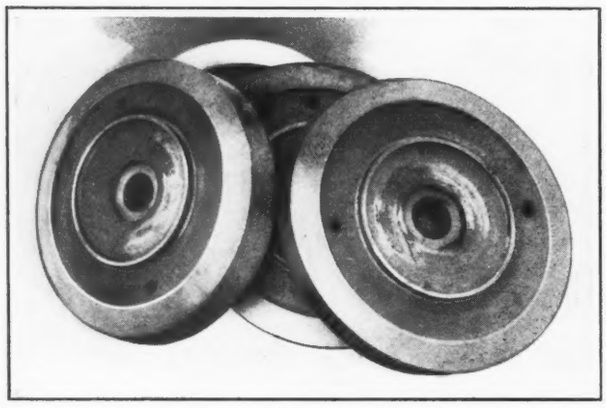


Fig. 8. Flywheels, 24 Inches in Diameter, Machined with Set-up Shown in Fig. 7

To perform all the required operations, the work must be chucked four times, the final operation consisting of bolting another housing, previously roughed out, on the housing already in the chuck, and finish-generating both spherical surfaces. In this way, the final cut forms the spherical surface in both halves, in the exact position that they will occupy when assembled.

The box-shaped holder *C*, used for the spherical turning operation, has a cylindrical shank *B* which is a sliding fit in the slide *A*. A pilot centers the holder relative to the work. The cutting tool is fastened in a swivel block which swings on a stud in the holder. When the collar *D* comes in contact with the pilot bushing in the fixture, an oscillating motion is imparted to the block by means of a link attached to the slide *A;* the slide receives its longitudinal movement from a hydraulic cylinder secured to the platen at the end of the machine. The machining time for roughing one of the halves of a differential housing is about 5 1/2 minutes.

Other Classes of Work Involving Simpler Tooling

Two sets of tools are provided in the turret for machining large tractor housings in a lathe of the turret type. The first chucking operation on this housing may be seen in Fig. 4. The operations consist of boring and reaming the hole, turning the outside diameter, and facing the flange and the end of the hub. A roughing and a finishing cut are taken over each surface.

This is another instance where only three stations of the turret are required to complete all the operations. Advantage is taken of this fact by adding a duplicate set of tools in the remaining three stations. Hence, the time elapsing between tool grinds is doubled, while the labor of resetting the tools is greatly reduced. By this method no time is lost in indexing empty stations, as would be the case if but one set of tools were used. Six and one-half minutes are required for the first chucking operation on each of these pieces.

For the second operation, the piece must be re-chucked. In this case, only simple facing cuts are required and the work is held in an air-operated adapter. To give extra support to the cutting tools and to lessen the vibration, heavy pilot-bars are employed. These bars are secured to the tool-holders in the turret station, and while cutting is in progress, they slide in a bracket attached to the headstock.

Very simple tool set-ups are possible in many cases; one instance of this is illustrated in Fig. 5. The piece shown gripped in the chuck of a platen type lathe is a forged-steel driver cap for a tractor wheel. The operations consist of facing the flange and the end of the hub, turning the hub, and rough- and finish-boring the hole. All operations on this piece are completed in 4 minutes, floor-to-floor time.

Fifteen cutting tools are used in machining the 24-inch tractor flywheels shown in Fig. 8. The tooling arrangement is illustrated in Fig. 7. The first operation consists of turning the outside diameter, boring and reaming the hole, facing the angle on one side, and cutting an oil-ring. The hole is rough- and finish-bored and reamed, while two cuts are taken over the outside diameter and the angular face. Four minutes are required for completing all the operations mentioned, not including the time required for loading the work in the chuck.

The flywheel is rechucked and the opposite side of the rim is faced, after which the hub is turned and faced and the inside of the rim bored. The cutting tools used in the second operation are mounted in special blocks which can be quickly located on the tool-slides without any preliminary tool-setting. Air chucks are used in both the first and second operations.

* * *

"The life of a chemically treated railroad tie is frequently three times that of an untreated tie," said C. C. Cook, maintenance engineer of the Baltimore & Ohio Railroad Co., at a conference held at the Department of Commerce in Washington, D. C. The use of chemically treated timber for cross-ties and other purposes saves the railroads of this country close to $150,000 a day, according to Mr. Cook.

Care of Gravity Lubrication Systems

Different Methods of Gravity Lubrication and Directions for Keeping the Lubricating Means in Good Condition

By H. L. KAUFFMAN

MODERN gravity systems of lubrication usually consist of a small number of distributing centers or manifolds from which oil is taken by piping as directly as possible to the various surfaces to be lubricated, each bearing point having its own independent pipe and set of connections. The aim of the gravity system, as of all lubrication systems, is to provide a reliable means of supplying the bearing surfaces with the proper amount of lubricating oil. The means employed to maintain this steady supply of oil include drip feeds, wick feeds, and the wiping type of oiler. Most manifolds are adapted to use either or both drip and wick feeds.

Drip-feed Lubricators

A drip feed consists of a simple cup or manifold mounted in a convenient position for filling and connected by a pipe or duct to each bearing to be oiled. The rate of feed in each pipe is regulated by a needle or conical valve. A loose-fitting cover is usually fitted to the manifold in order to prevent cinders or other foreign matter from becoming mixed with the oil.

When a cylinder or other chamber operating under pressure is to be lubricated, the oil-cup takes the form of a lubricator having a tight-fitting screw cover and a valve in the oil line. To fill a lubricator of this kind, it is only necessary to close the valve and unscrew the cover. The cover is then replaced and the valve opened sufficiently to give the rate of feed desired.

Operation of Wick Feeds

For a wick feed, the syphoning effect of strands of worsted yarn is employed. The worsted wicks give a regular and reliable supply of oil and at the same time act as filters and strainers. A wick composed of the proper number of strands is fitted into each oil-tube.

In order to insure using the proper sizes of wicks, a study should be made of the oil requirements of each installation, and the number of strands necessary to meet the demands of bearings at different rates of speed should be determined. When the necessary data have been obtained, a table should be prepared showing the size of wick or the number of strands to be used for each bearing of the machine.

Oil-conducting Capacity of Wicks

With the oil level maintained at a point 3/8 to 3/4 inch below the top of an oil-tube, each strand of a clean worsted yarn would carry slightly more than one drop of oil a minute. A twenty-four-strand wick would feed approximately thirty drops a minute, which is ordinarily sufficient for operating a large bearing at high speed.

The wicks should always be removed from the oil-tubes when the machinery is idle. If left in place, they will continue to deliver oil to the bearings until the supply in the cup is exhausted, thus wasting a considerable quantity of oil, as well as flooding the bearing. When bearings require an extra supply of oil temporarily, it may be supplied by dipping the wicks or by pouring oil down the tubes from an oil-can or, in the case of drip feeds, by opening the needle valves.

When equipment that has remained idle for some time is to be started up, the wicks should be dipped and the moving parts oiled by hand to insure an ample initial supply of oil. The oil should be kept at about the same level in the cup, as otherwise the rate of flow will be affected. Wicks should be lifted periodically to prevent dirt accumulations at the ends from obstructing the flow of oil.

How Lubricating Wicks are Made

Wicks for lubricating purposes are made by cutting worsted yarn into lengths about twice the height of the top of the oil-tube above the bottom of the oil-cup, plus 4 inches. Half the required number of strands are then assembled and doubled over a piece of soft copper wire, laid across the middle of the strands. The free ends are then caught together by a small piece of folded sheet lead, and the copper wire twisted together throughout its length. The lead serves to hold the lower end of the wick in place, and the wire assists in forcing the other end of the wick several inches into the tube. When the wicks are removed, the free end of the copper wire may be hooked over the tube end to indicate which tube the wick belongs to.

Dirt from the oil causes the wick to become gummy and to lose its filtering effect. Wicks that have thus become clogged with dirt should be cleaned or replaced by new ones. The cleaning is done by boiling the wicks in soda water and then rinsing them thoroughly to remove all traces of the soda. Oil-pipes are sometimes fitted with openings through which the flow of oil can be observed. In some installations, a short glass tube is substituted for such an opening.

Wiper-type Lubricating Systems

Wiper-type lubricators are used for out-of-the-way oscillating parts. A wiper consists of an oil-

cup with a central blade or plate extending above the cup, and is attached to a moving part. A strip of fibrous material fed with oil from a source of supply is placed on a stationary part in such a position that the cup in its motion scrapes along the fibrous material and wipes off the oil, which then passes to the bearing surfaces.

The oil-cups are usually filled with curled hair, which catches the oil and prevents it from being thrown out. Oil guns or hand-operated oilers are used to supplement lubricating systems of this type and to reach fast running parts. Cylinder oil is applied to the piston and valve rods with swabs or paint brushes. Grease cups are sometimes fitted in large bearings. Should the bearing temperature rise unduly, the hard grease in the cup will melt and give additional lubrication.

Oil manifolds, cups, and pipes should be cleaned occasionally with steam conducted through a hose or with boiling soda water. When soda water is used, the pipes should be disconnected, so that no soda water can reach the bearings.

* * *

EQUIPMENT FOR DIAMOND-BORING THIN-WALLED TAPPET GUIDES

The boring of accurately sized concentric holes in thin-walled bronze bushings requires considerable skill, even when done on precision machines such as are found in all large tool-rooms. To handle such work satisfactorily on a production basis obviously necessitates the use of carefully designed equipment. The boring tool must be capable of maintaining a keen cutting edge and be so held in the boring spindle that it can be adjusted accurately and held securely in place.

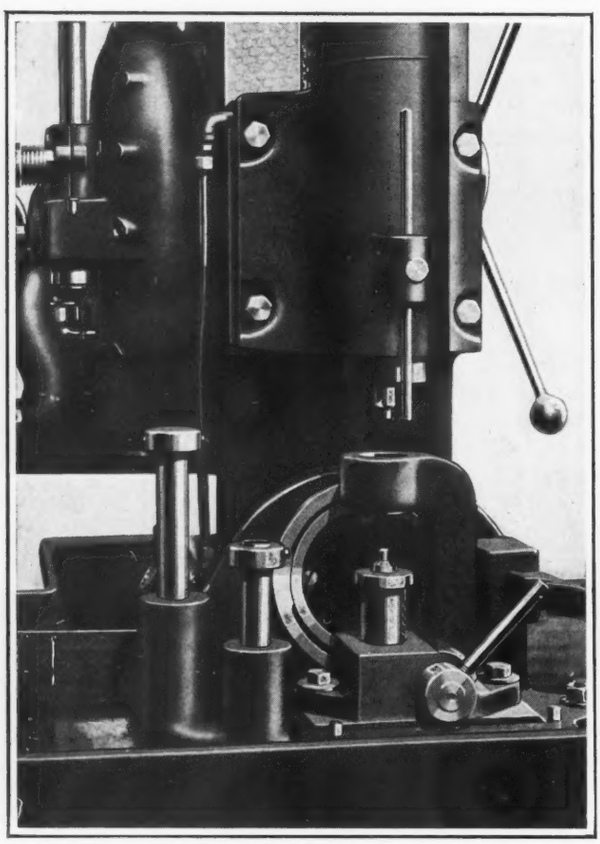


Fig. 1. Boring Fixture with Spring-tension Clamp

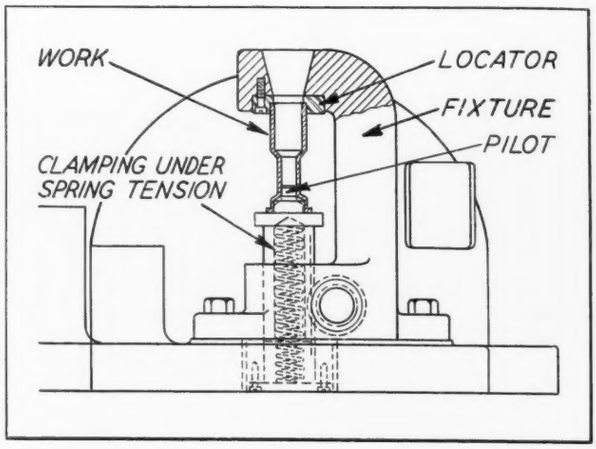


Fig. 2. Details of Fixture Shown in Fig. 1

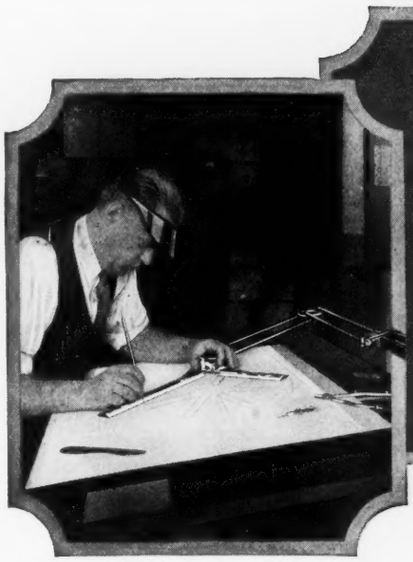
In designing a quick-loading fixture for handling work of this kind on a quantity production basis, provision must be made for centering the piece accurately and clamping it without distorting the thin walls. The fixture here illustrated has been found to meet these requirements satisfactorily. The tappet guide shown in position in the fixture is of bronze, and is held by a spring-tension clamping device while the upper end is being bored to a diameter of 0.8122 inch for a depth of 1.375 inches.

The upper end of the work, which is machined accurately to size, is located by a close-fitting counterbore in the locating ring into which it is pressed under the tension of the clamping spring. A rack-and-pinion-operated slide serves to compress the clamping spring and lower the locating pilot at the lower end of the work to permit reloading. The fixture is mounted on a Coulter boring machine built by the Automatic Machine Co., Bridgeport, Conn.

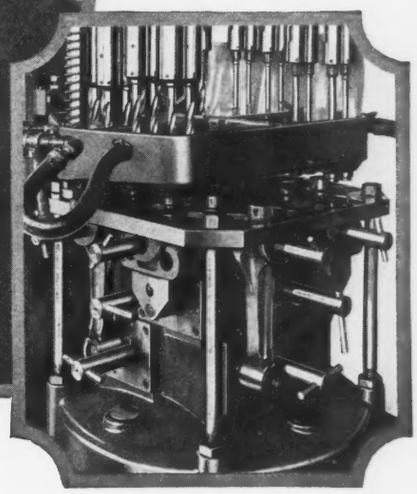
A diamond-boring tool is used in the spindle of the machine, which is run at a speed of 4000 revolutions per minute. The feed is 0.0006 inch per revolution, and the depth of the cut is 0.010 inch. The hole is required to be held within 0.0007 inch of the nominal size. The boring time is thirty-five seconds and the checking time ten seconds.

* * *

The Society of Automotive Engineers, in conjunction with the Aeronautical Chamber of Commerce of America, held an aeronautic meeting at the Palmer House, Chicago, August 26 to 28, during the National Air Races. Among the subjects discussed at the meeting were aircraft engines, airplane design, aircraft fuels, and spinning characteristics and control. Some unusually interesting points on the future trend of airplane design were brought out by William B. Stout, president of the Stout Engineering Laboratories, Inc.



Design of Tools and Fixtures



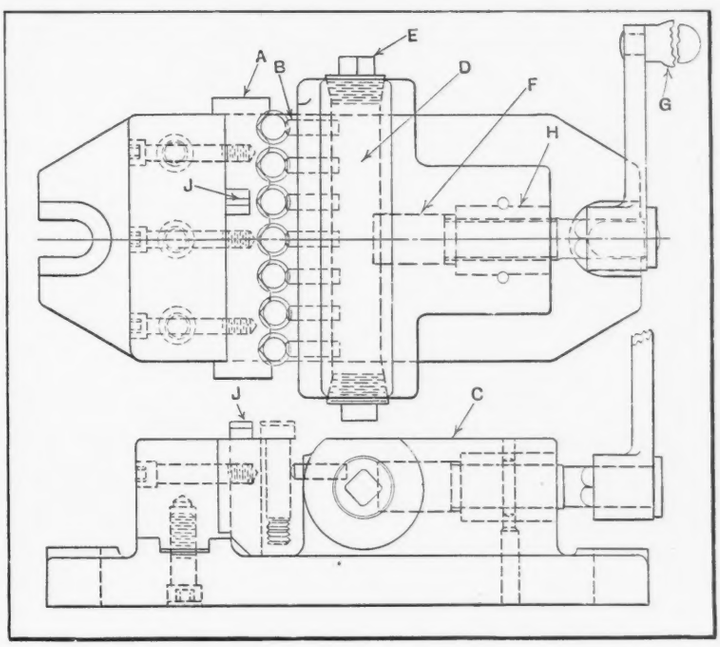
MILLING FIXTURE WITH CLAMPING EQUALIZER

By KENNETH M. BOWLBY, Garwood, N. J.

In the vise type of milling fixture here illustrated there is incorporated an equalizing arrangement in which beeswax is employed as a medium for transmitting an equal pressure to all the clamping members. Heavy grease may also be used for this purpose, although beeswax is preferable. The pieces to be milled are screw blanks, seven of which are held in a series of vees cut in the jaw *A*, which is fastened to the fixture by means of screws.

Clamping pressure for holding the work during the milling operation is obtained by means of the pins *B* which are a sliding fit in the base *C*. The right-hand ends of these pins protrude into a cylindrical chamber *D*, both ends of which are sealed tightly by the pipe plugs *E*. At right angles to this chamber is a bored hole in which the plunger *F* slides freely; and by turning the crank *G* on the end of this plunger, the latter is given a lateral motion through the nut *H*.

Thus, as the plunger moves to the left an equal pressure is transmitted through the medium of the beeswax, to the ends of the pins *B*, insuring a uniform clamping pressure for all the pieces. The construction of the fixture is such as to permit the use of interchangeable jaws for milling other work. The projection *J* on jaw *A* is provided for setting the cutters in the correct relation to the work, the width of this projection being equal to the distance between the cutters.



Fixture in which Beeswax is Used for Transmitting an Equal Pressure to All Clamping Members

ADJUSTABLE ARBOR FOR TURNING CROSS-HEAD SHOES

By CHARLES C. TOMNEY, Tool Designer, New Brunswick, N. J.

In Fig. 1 is shown a fixture used for turning the curved surface *Q* on the cross-head shoe shown in Fig. 2. These shoes are made of bronze and are planed at *O* and milled at *P*. Previously, each shoe was fastened in place on a cross-head by a slotted screw passing through hole *A*, and then turned in a lathe, the cross-head serving as an arbor.

After turning, the shoes were removed from the cross-head and the screw hole *A* filled with lead and smoothed off with a file. However, as only small screws could be used, the shoes could not be held securely; hence, an accurate job was almost impossible. With this method, it was also necessary to use the shoes in pairs as they were removed from the cross-head. Moreover, production was hampered, as the shoes could not be turned until their cross-heads were finished.

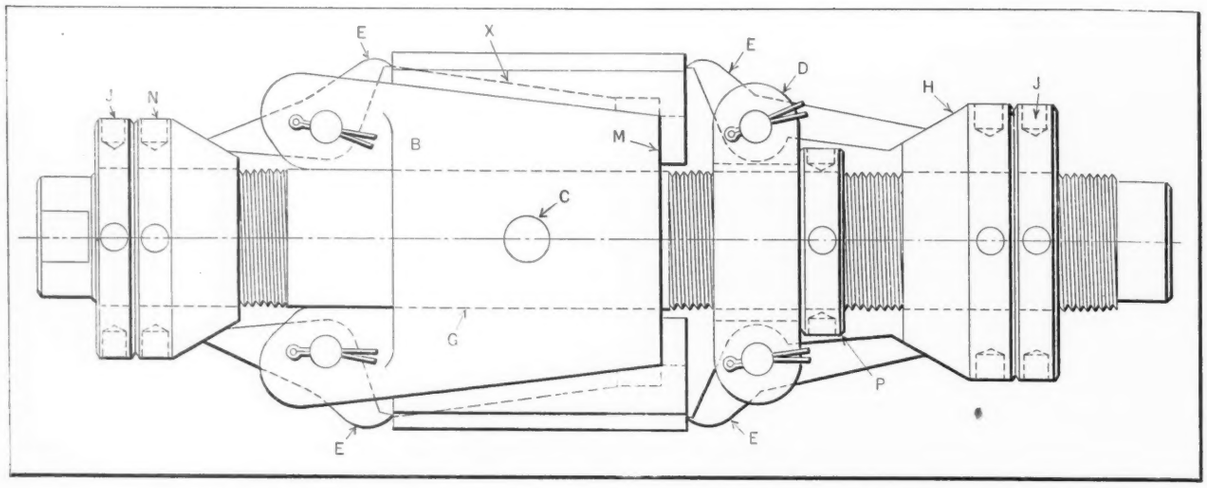


Fig. 1. Arbor which can be Adjusted for Turning Cross-head Shoes of Different Sizes

The fixture shown was made so that all shoes turned on it were interchangeable, and was also arranged so that shoes of several different sizes could be machined. The block *B*, Fig. 1, is a drive fit on the arbor *G*, and is prevented from moving endwise by a taper pin *C*. The tapered surfaces on this block are made with the same taper as the cross-head to which the shoes are to be fitted. The shoes are placed on the block, as shown, and are held securely by means of the toe clamps *E*. The two clamps at the left are pivoted on projections integral with the block *B*, while those at the right are pivoted in the yoke *D* and can be adjusted to suit the various lengths of the shoes.

This adjustment is obtained by turning the yoke on the threaded arbor *G*, after which it is locked in place by the check-nut *P*. To clamp the shoes on the tapered surfaces, nut *H* is screwed toward the center of the arbor, thus operating the clamping toes until the shoe is held tightly against the surface *M*, after which the nut *N* is turned until the other ends of the shoes are forced down on the block by the clamping toes. After the shoes are secured in this manner, the check-nuts *J* are screwed against the conical nuts to preserve their setting during the turning operation.

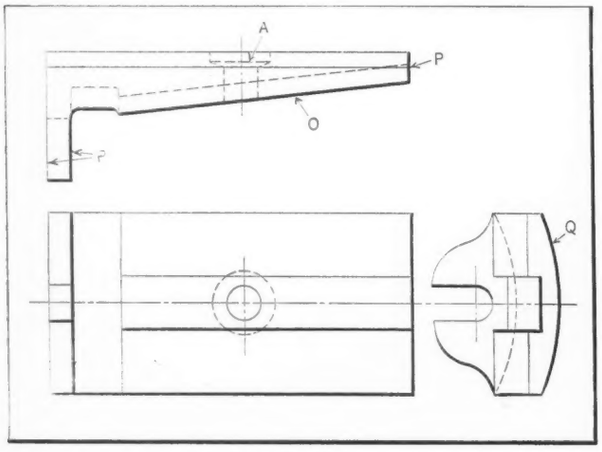


Fig. 2. Type of Cross-head Shoe Turned on Arbor Shown in Fig. 1

When larger work is to be turned, pads of the required thickness are bolted to the tapered surfaces of block *B*, and clamps *E* of special length are provided. In turning the shoes, the ends at the right are toward the tailstock so that the thrust is taken by the tapers and the inside of the shoes at *M*.

CONSIDER THE PRESS IN DESIGNING THE DIE

By JACOB H. FINKELSTEIN, Philadelphia, Pa.

Before turning the drawing of a die in to be checked, the draftsman should ask himself the general questions listed below, in order to be sure that the die can be used in the press chosen for the work.

1. Does the shut height of the die suit the press?
2. Is the press sufficiently heavy for the work?
3. Does the die clear the press gibs and housings?
4. Will piercings and blanks drop through the bolster?
5. Is the press stroke such that the piece can be easily removed from the die?
6. Is the die safe to operate?
7. Is the hole in the bolster too large to give sufficient support to the die bed?

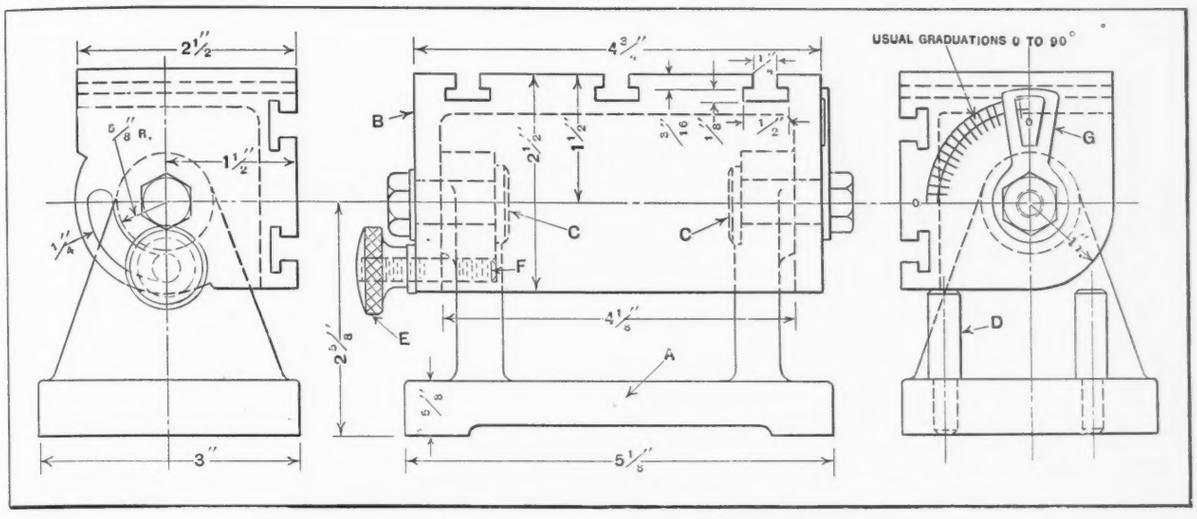
In many cases, if a list of this nature is used by the draftsman, much trouble will be avoided in both the tool-room and the production department.

ADJUSTABLE ANGLE FIXTURE

By JOHN G. JERGENS, Cleveland, Ohio

The adjustable angle fixture shown in the accompanying illustration will be found useful for laying out and machining light weight parts. The construction is shown quite clearly by the two end views and the side view. The dimensions of the fixture made by the writer are given in the illustration, but these can be varied to suit individual requirements. The T-slots are provided to permit clamping the work in place by means of small bolts.

The base *A* and the angle-block *B* are made from cast iron. The pivot studs *C* and the stop-pins *D* are hardened and ground. The top ends of the pins



End and Side Views of Adjustable Angle Fixture

D are ground to the exact height required to locate the surfaces of the block *B* parallel or at right angles with the base of the fixture as required. The knurled-head clamping nut *E* and the stud *F* are cold-rolled steel and casehardened. The indicator *G*, which is clamped to the stud *C* in a vertical position, is made from 1/16-inch stock.

BAR FOR SPHERICAL BORING

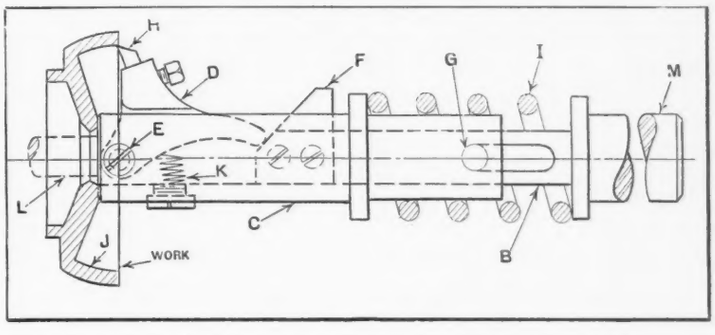
By W. N. DELENK, Machine and Tool Engineer, National Acme Co., Windsor, Vt.

The boring-bar here illustrated is used in a turret lathe for boring the spherical surface *J* of the work shown. The simplicity of the design and the manner in which the cutter is prevented from scoring the bore while being removed from the work are the chief features of this tool.

The shank *B* is held securely in the station of the turret, and on it slides the sleeve *C* carrying the swivel tool-holder *D*. The latter is pivoted at *E* and is given an oscillating movement by means of the cam plate *F* fastened to the shank *B*. A spring *I* is provided to prevent any lost motion between the tool-holder and the cam while the bar is in use. Driven in the sleeve is a pin *G* passing through an elongated hole in the shank, which serves to limit the lateral movement of the sleeve and also acts as a stop to limit the movement of the cutter *H*.

In machining the spherical surface, the operator feeds the turret toward the left until the end of the sleeve *C* comes in contact with the work as shown. Further movement of the turret causes the member *B* to slide in the sleeve and carry the cam plate *F* against the projecting finger on the tool-holder *D*, thus swinging the cutter *H* in a circular path. However, in starting the cut, it is necessary for the operator to hold the finger of the tool-holder in contact with the cam plate against the pressure of the coil spring *K*; on the return of the bar the finger does not continue to bear on the cam plate, but is held in an outward position by spring *K*, so that the cutter clears the spherical surface as the bar is being removed from the work.

When heavy work is being machined with a tool of this type, tool chatter may be avoided by the use of a pilot *L* on the sleeve *C*. This tool may also be designed with a flange at *M* instead of the shank shown, to suit the type of turret in which it is used.



Bar for Spherical Boring in which the Cutter Clears the Work as it is being Removed from the Bore

ALIGNING PARTS IN AN ARBOR PRESS

By GEORGE L. PYRITZ, Indianapolis, Ind.

Pressing bushings, ball bearings, studs, etc., in their housings with an arbor press has always been more or less troublesome because of the inaccurate alignment of the parts being assembled. Usually some makeshift method is employed which is not at all in keeping with the production methods followed in machining the parts. This often results in damaged parts and costly delays in shipments.

A large concern manufacturing automobile parts has successfully solved this problem by equipping a number of arbor presses with the simple and inexpensive tools shown in Figs. 1 and 2. The success of these tools lies in the fact that the parts are kept in alignment while being pressed together.

In Fig. 1, the dot-and-dash lines represent a bronze bushing in position to be pressed into an

automobile water pump body. The bushing is held on a pilot *L* by means of a spring-actuated ball *A*, while the pump body is centered over the pilot *B*. The upper and lower pilots are inserted in the arbor press ram and table, respectively, and can be easily removed.

Referring to the construction of the tools, *C* is a steel plate, of suitable size, screwed and doweled to the arbor press table. On this plate is mounted a sheet-steel tray for holding a supply of bushings, bearings, etc. A hardened steel bushing *D*, pressed into the plate *C*, has an accurately ground hole in it which is a slip fit for the shank of the lower pilot. The center line of the bushing coincides with that of the upper pilot.

The lower pilot *B* has a groove *G* in it which engages the pin *E* (see Fig. 2). Similarly, the upper pilot has a flat *H* and a groove *J* into which the pin *F*, Fig. 1, enters. This pin is a drive fit in the ram and prevents the pilot from falling out of the ram bore, which is a slip fit for the shank of the pilot. The pilots are made of steel, hardened and accurately ground. The advantage of hardening is that they cannot be nicked, and wear is reduced to a minimum, thus preserving their alignment.

After the press has been prepared in this manner, it is only necessary to make a set of pilots for each job. The low cost of these pilots and the ease with which they can be inserted is apparent.

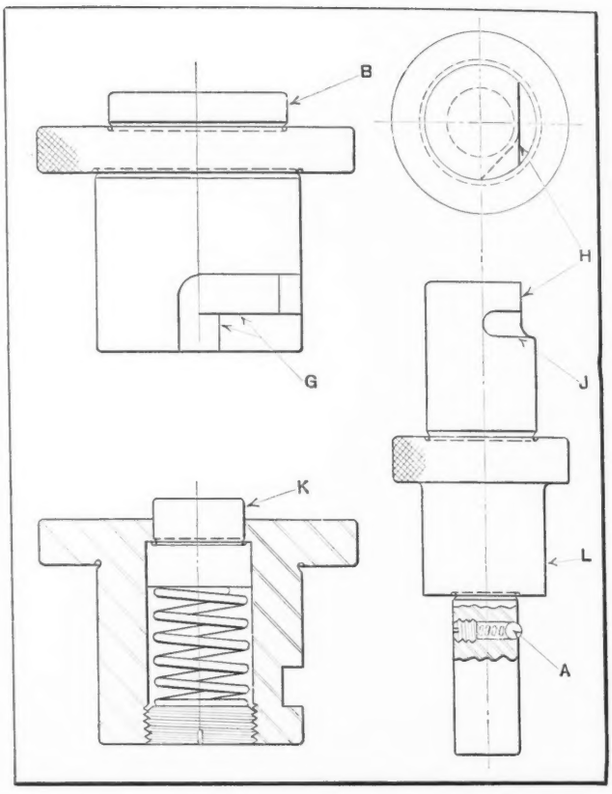


Fig. 2. Details of Pilots Used in Arbor Press

It is often found necessary to locate the work by means of the bore into which the bushing is to be pressed, in which case the solid lower pilot cannot be used, since it would prevent the bushing from being pressed in to the proper depth. However, by employing a spring-actuated pilot, as shown at *K*, Fig. 2, the latter will be pushed out of the bore as the bushing reaches its final depth.

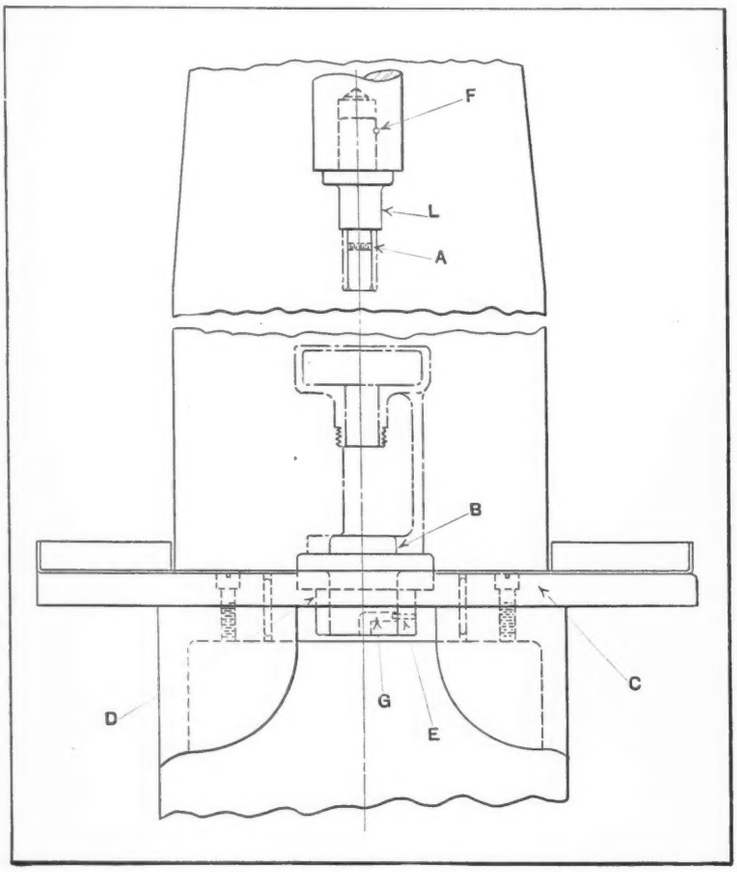


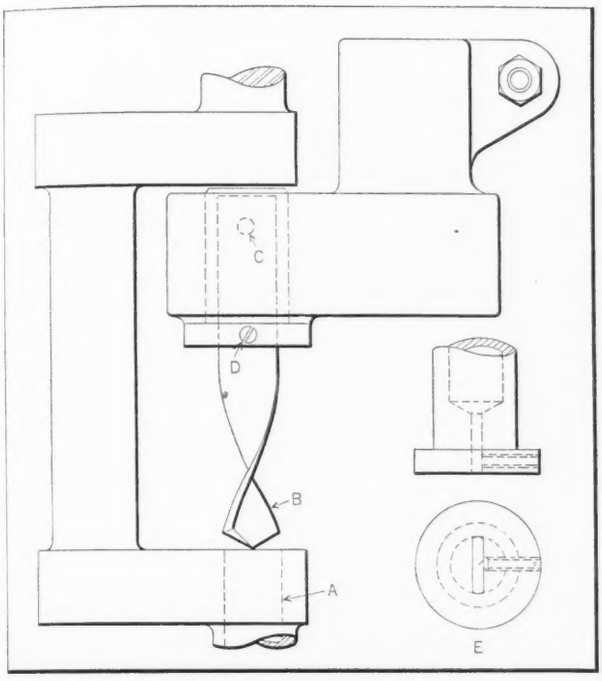
Fig. 1. Arbor Press Equipped with Pilots for Aligning Work

DRILLING CRANKSHAFT PINS WITH OFFSET DRILL HEAD

By D. A. BAKER, Long Island City, N. Y.

The writer once had occasion to tool up an airplane crankshaft. One of the interesting and unusual operations on the shaft was drilling out the center of the pins to lighten the weight. A partial view of this shaft is shown in the illustration, the hole to be drilled being shown at *A*. A special type of drill and an offset drill head were used. The head was attached to the spindle of a drill press and was of the usual gear-driven type. As it was impossible to design a head that would go into the limited space and do the drilling in one continuous feeding movement, other means were devised as follows:

First, a drill was made, as shown at *B*, from a flat bar of high-speed steel 1/4 inch thick, which was heated and twisted at one end as shown. It was then centered and rough-ground on the diameter and the flats of the shank, after which the two



Drill Head in which Drill is Clamped in Two Positions to Drill Long Holes in Crankshafts

spottings *C* and *D* were laid out and countersunk with a standard center drill. The drill was next hardened and finish-ground, the point also being ground to provide cutting edges.

The drill driving spindle in the head was made as indicated at *E*. The lower end of the spindle had a driving slot machined in it, which was filed to correspond with the shape of the drill shank, and it was provided with a cone-pointed set-screw to engage the countersunk holes drilled in the shank.

In operation, the crankshaft was held in a suitable fixture attached to the drill press. The drill was placed in the head and pushed up as far as it would go, where it was retained by the cone-pointed set-screw. In drilling the hole, the drill was fed down until spindle *E* came in contact with the shaft, after which the head was raised and the drill dropped down until the pointed screw engaged the countersunk hole at the top of the drill. The latter was then locked by the screw in this position and the rest of the hole drilled.

Incidentally, it may be mentioned that these flat drills gave remarkable results. While the crankshaft material consisted of chrome-nickel steel, heat-treated to a scleroscope hardness of 45, unusually heavy feeds could be taken, and fast speeds used with these drills without breakage.

VISE FIXTURE FOR BENDING TUBING

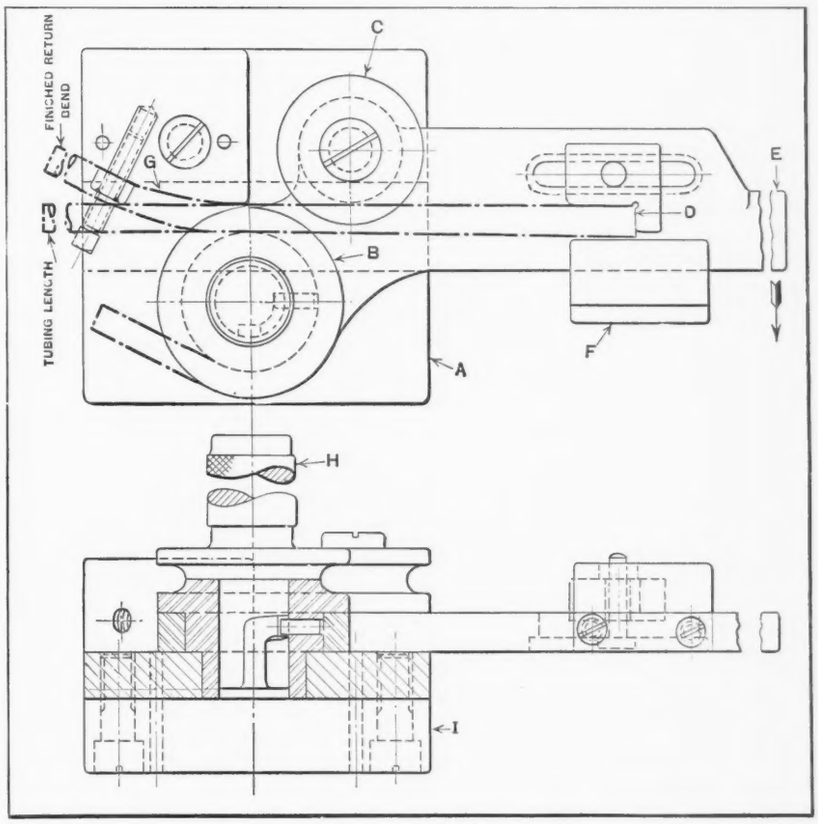
By J. E. FENNO, Bloomfield, N. J.

The vise fixture shown in the illustration is used for forming two bends in a return-bend tube with one sweep of a hand-lever. The tubing, which has previously been cut off to the proper length, is passed between the two grooved rolls *B* and *C* until it comes against the adjustable stop *D*. The operator then grasps the hand-lever *E* and swings it in the direction of the arrow, the idler roll *C* bending the tubing around the roll *B*, which is pivoted in the base. The final bend is made when the block *F* on the lever forces the free end of the tubing against the curved surface of the anvil *G*, the set-screw in the latter acting as a stop against the lower part of the block *F*.

To remove the finished piece from the fixture, the top half of the roll *B* is first lifted off; it is held in place by a bayonet locking arrangement, which is released by turning handle *H* counter-clockwise. The fixture is held in a bench vise, the jaws of which grip the strip *I* fastened to the fixture base.

* * *

This is a good time for the gathering up and marketing of junk. In most plants there is a great deal of scrap iron, old machinery, and other useless material around. Such material should be gathered up at this time, when production is less pressing, and disposed of. By cleaning up the shops and premises now, the plant will be in better shape to produce efficiently later on.



Tube Bending Fixture in which Bends are Formed with One Sweep of a Lever

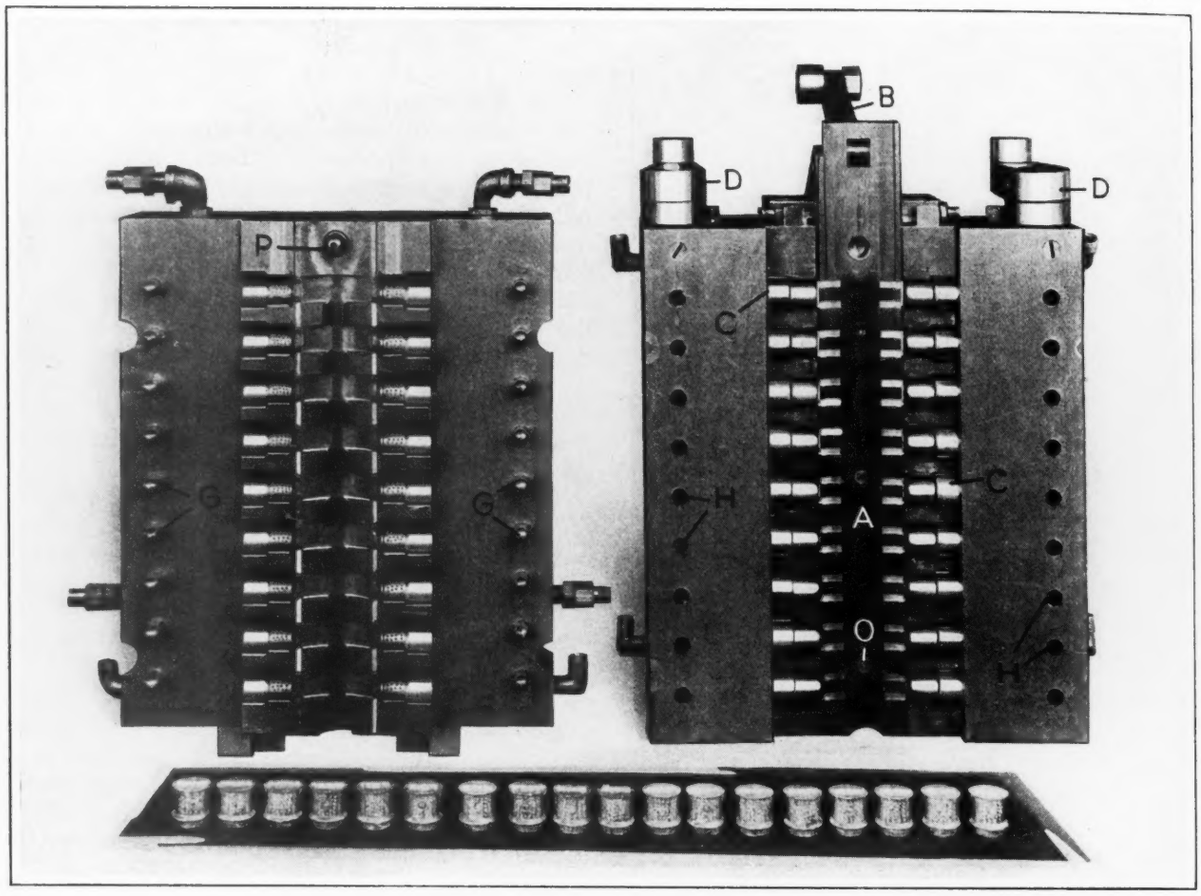


Fig. 1. Die Set Having a Slide in the Movable Die which Cuts All Sprue Metal from the Eighteen Castings When This Die is Withdrawn from the Stationary Member

Design of Automatic Die-casting Dies

Die Set Provided with a Slide that Shears off the Sprue Metal from the Eighteen Parts Cast Fourth of Five Articles

By CHARLES O. HERB

SMALL lead castings, approximately 5/8 inch long by 11/16 inch outside diameter, are produced at the rate of 100 per minute by the use of the dies shown in the accompanying illustrations. These dies were designed for use on die-casting machines built by the Madison - Kipp Corporation, Madison, Wis. In Figs. 1 and 2, eighteen of the parts are shown beneath the dies. This number of parts is cast at each "shot" of molten lead into the dies, an average of 5 1/2 shots being made per minute. A pressure of from 225 to 250 pounds per square inch is used to force the metal into the die cavity. A blind hole 7/16 inch in diameter extends almost the full length of the pieces.

All Excess Metal is Cut off the Parts by Means of a Slide

One of the features of these dies is the use of a slide in the movable die to shear off all excess sprue metal from the pieces. This slide *A* is shown in Fig. 1 in the position it occupies when the face of the movable die is tight against the stationary die at the left, ready for a casting operation. At the end of an operation, the slide is gradually pushed downward while the movable die recedes from the stationary die, until it reaches the position shown in Fig. 2. During its downward movement, the slide cuts off all excess metal on the closed end of the pieces, the metal falling free of the dies.

The movements of slide *A* are obtained through a roller attached to the upper end of bellcrank lever *B* (see also Fig. 3), which engages a path formed by cam-blocks on a combination bar mounted on the top of the machine. When the movable die carriage travels away from the stationary die and carries the roller along the cam path, lever *B* is swiveled, thus moving slide *A* downward. Pilot *P* (see Figs. 1 and 2) on the stationary die enters a hole in the upper end of slide *A* when the dies are closed, so as to locate the slide accurately for the

casting operation. While Figs. 1 and 2 show dies for producing eighteen pieces at once, and Fig. 3 shows the movable die of a set designed for casting twenty-four pieces at each "shot" of the die-casting machine, the mechanisms for moving the cores, the sprue-metal cutting slide, and the ejector-pins are the same in both die sets.

Operating the Eighteen Cores Sidewise

The holes in the parts are formed by means of cores *C* (see section *Y–Y*, Fig. 3) which may be seen in the die cavities of the movable die in Fig. 1. They are shown in Fig. 2 withdrawn from the cavities, only the outer ends being visible. The cores are withdrawn from the castings when the movable die carriage continues its return movement after slide *A* has performed its function, motion being imparted to the core mechanisms by rollers attached to cranks *D*, which travel along cams on the under side of two more combination bars fastened to the top of the machine. These combination-bar cams cause the cranks to revolve through 140 degrees in a horizontal plane.

As cranks *D* swivel on their axes they actuate two pinions *E* (see Fig. 4) which extend the entire height of the dies. These pinions mesh with rack teeth on holders *F* to which the cores are attached. Consequently, as the pinions revolve, they withdraw all eighteen core holders and their cores at the same time.

The reverse action, of course, takes place when the movable die carriage advances to close the movable die against the face of the stationary die. At that time the cores are pushed forward sufficiently to allow the eighteen pins *G* (see Figs. 1 and 2) on the stationary die to pass through holes *H* in the movable die and enter holes in the outer ends of the cores. (The core holes are visible in Fig. 2.) By this means the cores are accurately positioned and locked for the operation.

Ejecting the Castings

Directly in back of the carriage, there is a vertical combination bar *J*, Fig. 3, attached to the guide bars of the die-casting machine. This combination bar actuates the ejector-pins which force the castings from the movable die where they are held securely until cores *C* are withdrawn.

When the carriage nears the end of its return stroke, rollers attached to the rear ends of plates *K* run along paths *X* which are formed on the combination bar by the use of cam-blocks. This movement of the rollers causes plates *K* to swing on their pivots and push rods *L* toward the left, as the die

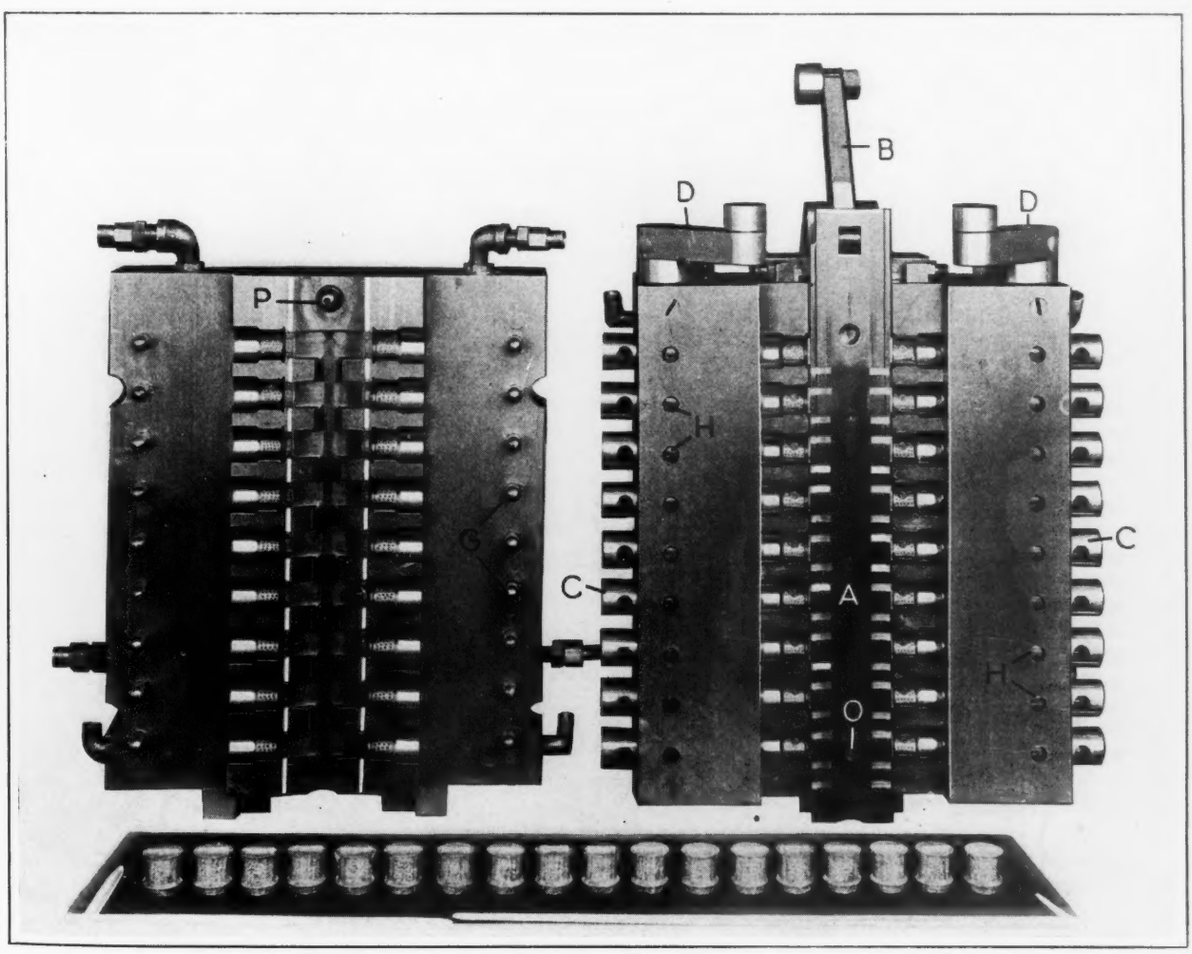


Fig. 2. Another View of the Dies in Fig. 1, Showing the Slide that Cuts off the Sprue Metal in the Lowered Position

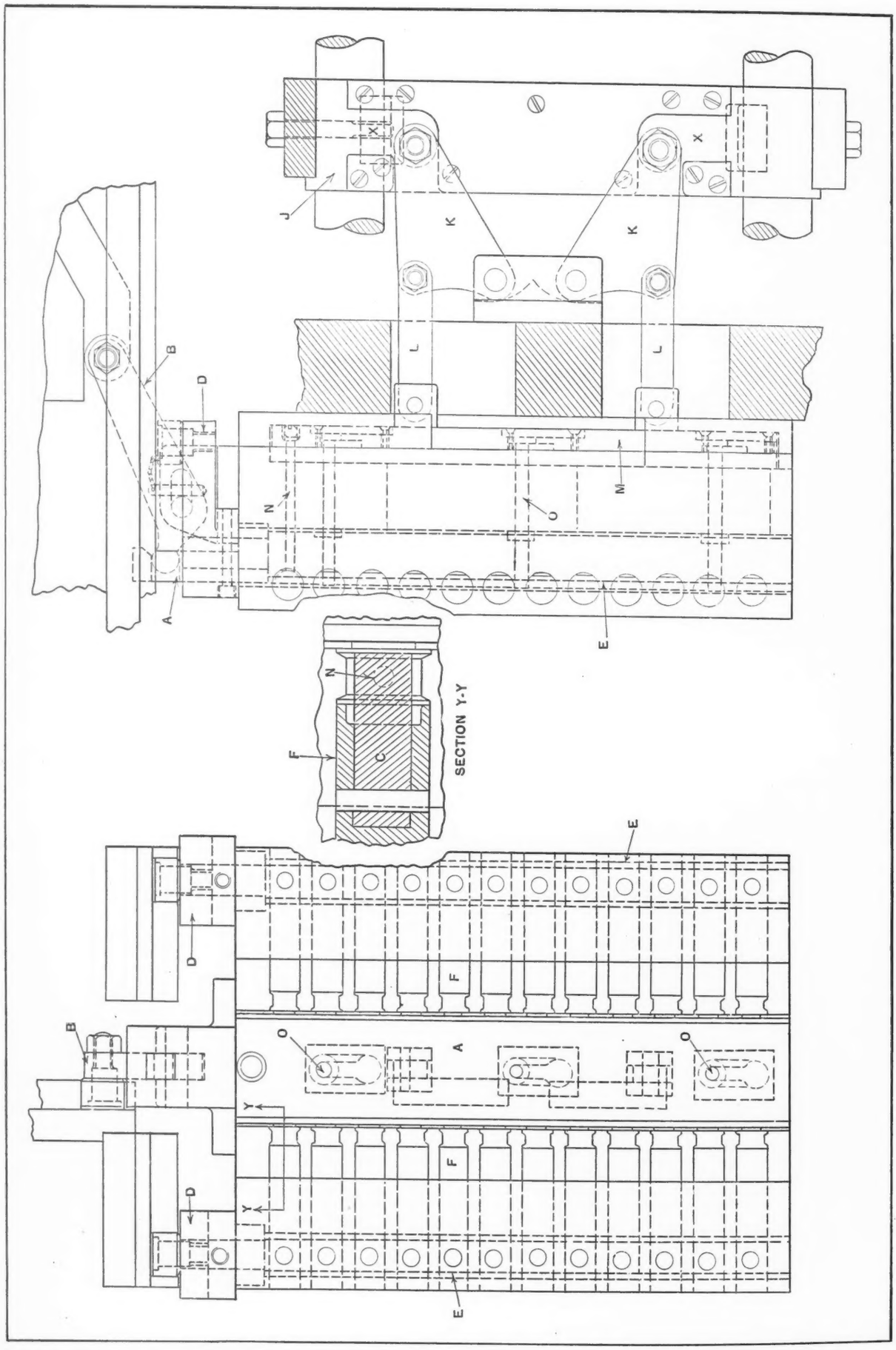


Fig. 3. Movable Die with Mechanism for Moving the Sprue-metal Cutting Slide, for Moving Twenty-four Cores Horizontally, and for Actuating Twenty-seven Ejector-pins

is viewed in the illustration. The opposite ends of both rods, being connected to plate *M*, push this plate forward also. Attached to plate *M* is a series of pins *N*, Fig. 4, which extend to each cavity and eject the castings as the plate is pushed forward.

Three pins *O*, attached to plate *M* at the center, eject the sprue metal which may adhere to the face of slide *A*. Since these three pins extend through slide *A* and must move vertically with it, they are held in T-slots in plate *M* rather than in round holes.

While the cam-blocks that form paths *X*, Fig. 3, move the ejector-pins forward to force the castings from the die, they also provide a positive return for the ejector-pins. This is due to the fact

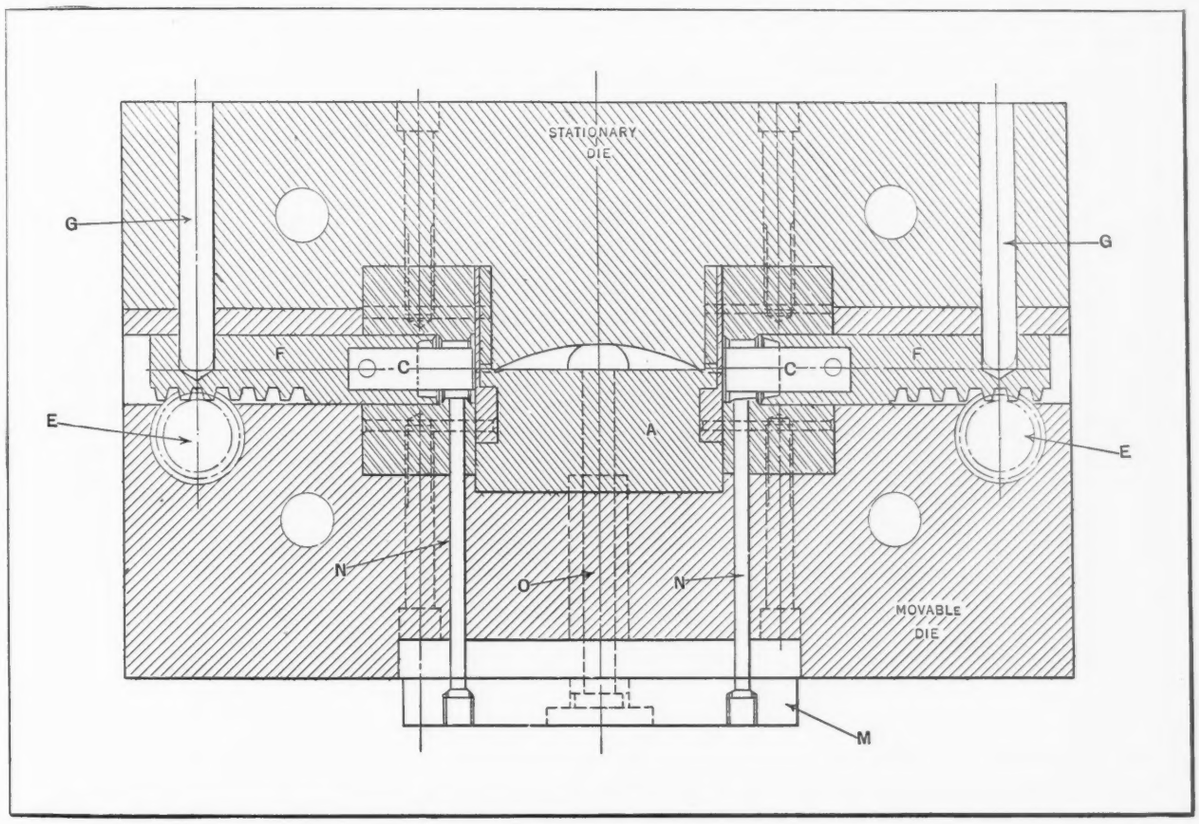


Fig. 4. Sectional View through the Movable Die Illustrated in Fig. 3, Showing the Mechanism by which the Cores are Inserted into the Die Cavities and Withdrawn from them

that the rollers attached to plates *K* must travel vertically in paths *X* before they are withdrawn from the horizontal paths.

Slide *A* and pins *O* can be removed from the die without taking the die from the machine. Both dies are water-cooled through the pipe connections seen in Figs. 1 and 2.

Patents have been applied for to cover the various movements described in this series of articles. The next article will appear in October MACHINERY.

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The San Diego air mail and passenger service inaugurated recently has reduced the traveling time between San Diego and Seattle to 12 3/4 hours, as against 49 1/2 hours by train.

DIE AND TOOL BUILDERS' ASSOCIATION

The National Die and Special Tool Builders Association, with headquarters at 40 N. Wells St., Chicago, Ill., is organizing branches in some of the larger industrial centers. At a recent meeting held in Cleveland, steps were taken to form a local branch of the Association in that city. There are approximately eighty firms in the Cleveland territory engaged in making dies and special tools. All of these will be invited to attend a later organization meeting at which permanent officers are to be elected. The following temporary officers were elected at the meeting: J. R. Fitzsimmons, Danly Machine Specialties, Inc., chairman; T. L. Galvin, Die Engineering Works, vice-chairman; William E. Millers, Enterprise Tool Co., treasurer; M. Mertz, Danly Machine Specialties, Inc., secretary. George R. Tuthill is secretary of the national association.

* * *

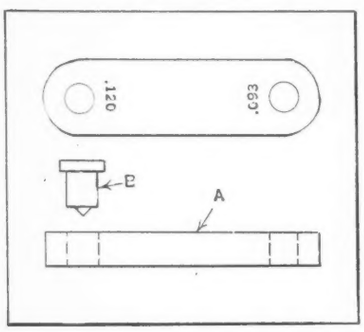
The importance of the deposits of tungsten ore available in Southern China may be gaged from the fact that, according to an item in *Engineering*, China produces more than one-half of the tungsten ore in the world. The presence of tungsten ore in China was discovered in 1916. In 1926, about 7500 tons of the ore were mined, but since that time, mining operations have been seriously interfered with by the unsettled political conditions in the country.

Ideas for the Shop and Drafting-room

Time- and Labor-saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

HOLE-LOCATING AND DRILL-SPOTTING BLOCKS

Several blocks like the one shown in the illustration have been used by the writer for a number of years for locating and spotting drilled holes. The block shown is simply a piece of tool steel *A* about 3/8 inch wide by 1/4 inch thick by 1 1/4 inches long. The holes at the ends of the block are carefully drilled, bored, and reamed on a bench lathe, and their sizes stamped on the upper side of the block. The sizes of these holes are determined by the particular job on which the block is to be used. After the blocks are made as described, they are hardened and ground on the bottom surface. The holes are then either lapped out or ground with diamond dust, following which plugs like the one shown at *B* are made up. These plugs are ground from hardened drill rod to a close fit in the holes and have a small center punch on one end as indicated.



Block Used for Locating and Drilling Small Holes

In using this tool, the work is first laid out with a height gage. At the intersections of the scribed lines a light center is made with a small round file which has been sharpened to a fine point. In making the centers, the point of the file is carefully located at the exact intersection of the lines with the aid of a magnifying glass. When thus located, a little pressure is applied and the file turned between the fingers while being held as nearly vertical as possible. The center obtained in this manner is then inspected with a magnifying glass, and if not located at the exact intersection of the lines, a little side pressure is applied to deepen it sufficiently to bring it into accurate alignment.

When all the centers have been thus located, the block *A*, with one of the plugs inserted, is placed so that the point on the plug is in one of the centers. The block *A* is then clamped in place and the plug removed to permit spotting the work with a drill which is the same size as the hole in block *A*. A smaller drill is now used to drill the hole through the work. The final finishing of the hole is done with a reamer which is also guided by the hole in the block.

Long Island City, N. Y. DONALD A. BAKER

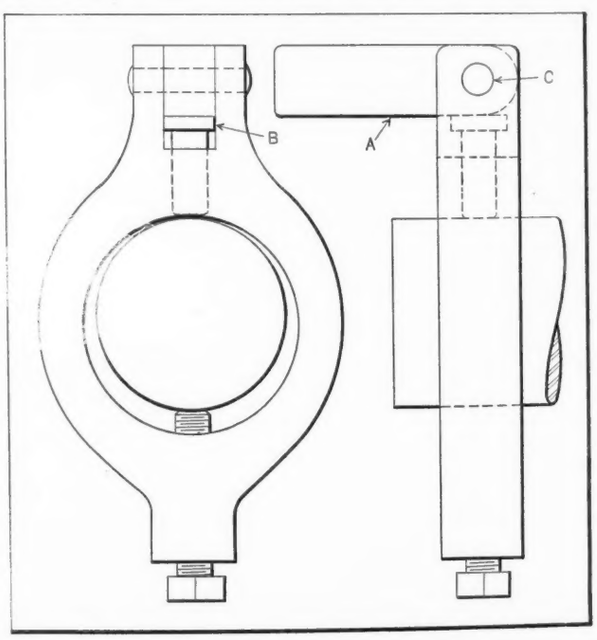
PREVENTING EDGES OF DRAWINGS AND TRACINGS FROM CURLING

The annoyance caused by having the bottom edge of a drawing or tracing roll up or become creased, as a result of contact with the clothing when leaning over the drawing-board, can easily be eliminated by protecting the edge with a piece of cardboard about 1 1/2 inches wide. The strip of cardboard can be fastened in place over the lower edge of the drawing or tracing by means of thumb-tacks. This simple remedy prevents the edges of the drawing from becoming ragged and unsightly, and does not interfere with the draftsman's work.

Philadelphia, Pa. GEORGE A. FRIES

LATHE DOG WITH REVERSIBLE TAIL

Anyone who has done much straight turning on long shafts in a lathe knows how awkward it is, when reversing the shaft between the centers, to reverse the dog so that the tail will once more engage the slot in the faceplate. If the shaft is long, it is usually necessary to lay it down on the ways before the dog can be removed and reversed. The dog shown in the illustration, however, need not be removed from the shaft, as it can be slid to the opposite end of the shaft, and the tail reversed.



Dog which Need not be Removed when Reversing the Work between Lathe Centers

The tail *A* is made of a piece of rectangular steel, and the dog of flat steel bored out to suit the work

and slotted at the top for the tail. The pin *C* passes through the dog and serves as a hinge for the tail. It is obvious that when the set-screw is tightened on the work, it automatically locks the tail by means of the sliding pin *B*. When the screw is loosened to move the dog, the pin *B* drops down and releases the tail, thus allowing it to be swung to the opposite side of the dog.

Hamilton, Ont., Canada H. MOORE

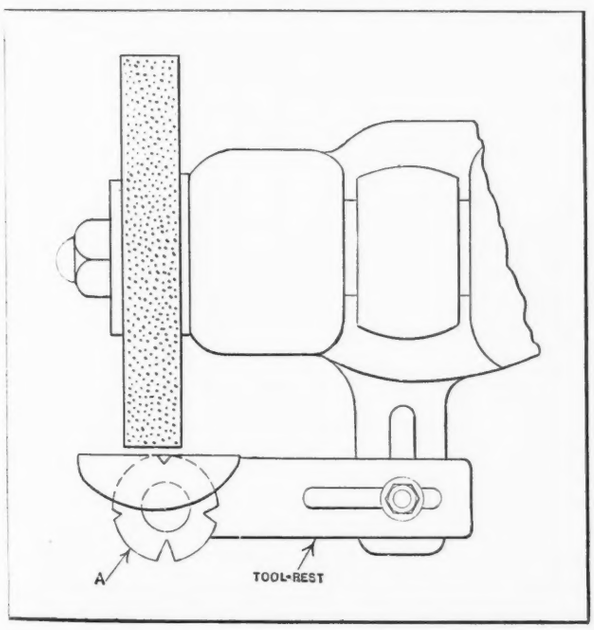
COUNTING SMALL PARTS BY WEIGHING

The weight per gross of uniform pieces, in pounds, equals numerically the weight of nine pieces, in ounces. This rule is based on the fact that 9 is to 144 as 1 is to 16. Thus, if nine pieces weigh 3 ounces, one gross will weigh 3 pounds. This rule provides a rapid means of filling orders for parts required in gross lots. P. R. H.

GAGE FOR GRINDING THREADING TOOLS

In many small shops, lathe operators are required to grind their own threading tools. There are usually a number of men in such shops who do not possess thread gages and who make a practice of borrowing them from other workmen. Partly to eliminate this borrowing, but mainly for the convenience of all the men, the writer devised the thread gage *A* shown in the accompanying illustration. This gage is attached to the grinder, where it is always in the most convenient position for gaging the tool.

The gage is circular in form and is made from a piece of 1/8-inch sheet steel. The hole in the center



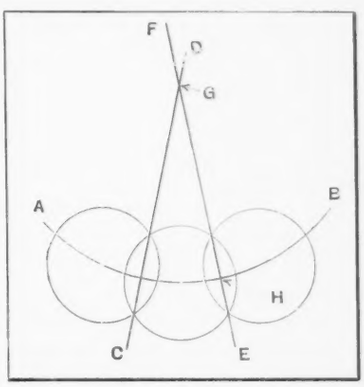
Tool Grinder Equipped with Threading-tool Gage

is bored out to fit the shank of the tool-rest, and four V-slots for gaging the points of threading tools are cut in its periphery. The slots are cut to different depths to accommodate inside threading tools of different sizes. The gage is not tightened on the tool-rest, but left loose so that it can be spun around to bring any V-slot into position for testing.

Hamilton, Ont., Canada ARTHUR KENDALL

FINDING THE RADIUS OF AN ARC

Occasionally a draftsman finds it necessary to locate the center from which a small arc is drawn, or an arc representing a relatively small portion of a complete circle. This can be done quickly and conveniently as described in the following. Assume that *AB* is the arc. Draw three intersecting circles, as shown, with their centers located on the arc. Next draw lines *CD* and *EF* through the intersecting points of the three circles. The point *G* at which these lines intersect is the center from which arc *AB* is drawn, and the radius is *GH*.



Method of Finding Radius of Arc AB

This method is a practical means of determining the radius of a part, of which only a relatively small segment is available. The piece is simply placed on a clean smooth board or a piece of new tin, and an arc is scribed around the circular part of the segment, making the arc as long as the piece will permit. The radius of this scribed arc can then be determined as described.

Philadelphia, Pa. H. M. TAIT

SIMPLE LATHE-BRAKE MADE OF BELTING

To the operator doing production lathe work, the time necessary to stop the machine between each piece is a big factor. The simple device for stopping a lathe described here can be made in a few minutes and is safe, as the operator is not likely to catch his hand or clothing in the gears.

To make the brake, one end of a piece of belting is laced loosely around the back-gear shaft. The free end of the belt is then dropped over the cone step and cut off about 3 inches from the bed of the machine. After the shipper is thrown off, it is only necessary to rest the hand lightly on the part of the belt next to the cone to bring the machine to a rapid stop. The brake can be slid along so that it can be used on any step of the cone. The belt rests lightly on the cone step and does not interfere in any way with the operation of the lathe.

Boston, Mass. CHARLES R. WHITEHOUSE

[This type of brake, of course, might be unsafe where the cone is to be reversed, as the tendency then would be to throw the belt, and possibly the operator's hand, toward the rear of the machine.—EDITOR]

Questions and Answers

VOLUME OF CONIC SECTION

L. M. S.—In designing containers for liquids, we often find it necessary to determine the volume of a conic section, such as indicated by the shaded portion U of the accompanying illustration. For example, we have a container in the form of a cone with its axis horizontal as indicated in the illustration. The container is to be partly filled with

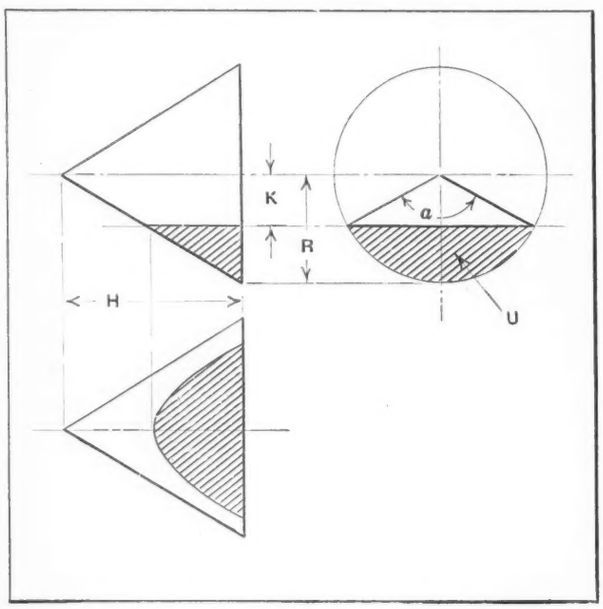


Diagram Showing Conic Section U Cut off by Plane Parallel with the Axis of the Cone

liquid to a given distance K below the center line or axis. Is there a formula for determining the volume of a conic section representing the liquid in the container?

Answered by Olof Anderson, West Allis, Wis.

The following formula was developed by the writer for finding the volume of a conic section or "ungula" cut off from a cone by a plane parallel to the axis:

$$V = \frac{a}{360} \times \frac{\pi R^2 H}{3} - \frac{2KH\sqrt{R^2 - K^2}}{3} + \frac{HK^3}{3R} \times 2.3 \log \left(\frac{R + \sqrt{R^2 - K^2}}{K} \right)$$

In this formula,

V = volume of conic section, indicated by the shaded portion U in the illustration;
a = center angle, in degrees;
H = height of cone;
R = radius of cone base; and
K = distance of cutting plane from axis of cone.

QUALITIES OF A WIRE-ROPE LUBRICANT

T. P.—What particular qualities should be possessed by a lubricant for wire ropes? Will a grease or a straight mineral oil prove most effective for the average service in which a wire rope is placed?

Answered by H. L. Kauffman, Denver, Colo.

A wire-rope lubricant should be neutral and of just the correct viscosity and degree of adhesiveness to meet the needs of the service in which the rope is placed. In general, the purpose of a lubricant of this type is: (1) To prevent rust and corrosion; (2) to lubricate, effectively, the individual strands and the wearing surfaces of drums or sheaves; and (3) to insure that the hemp core will remain soft and flexible.

It is possible for certain lubricants to serve one purpose, but fail almost entirely to meet other requirements. For instance, some might have the ability to penetrate and to maintain the core in proper condition, and yet, because of low viscosity or lack of adhesiveness, fail entirely as strand lubricants—being incapable of resisting the throwing-off effects of centrifugal force or the tendency to drip due to gravity.

Such lubricants often are not able to prevent rust or corrosion. However, a wire-rope lubricant must never be too viscous or heavy in body, because it may then be lacking in penetrative ability; and, though outwardly the lubricant might seem to function effectively, it is probable that the inner strands and core would be imperfectly lubricated and therefore subject to rapid deterioration.

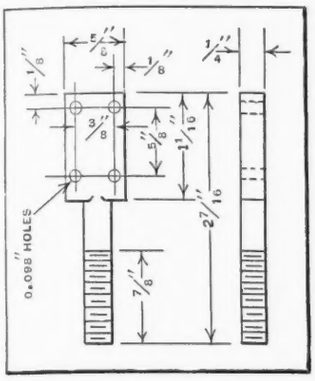
Greases are less adhesive than straight mineral oils of asphaltic-base origin, and for that reason, the writer is inclined to favor the latter type of lubricant for average wire-rope service—for example, one having a viscosity of approximately 500 to 1000 seconds at 210 degrees F., the exact viscosity varying with the service in which the rope is used.

The greatest harm resulting from inadequate lubrication of wire rope is corrosion and decay. This occurs even when the outer surface, kept bright by friction, would indicate that the rope was in good condition. As a wire rope bends over sheaves and drums, there is necessarily a rubbing together of the internal wires and, naturally, the wear due to this friction will be less if each wire is properly oiled. This also applies to external friction.

It can readily be seen, therefore, that correct wire-rope lubrication does not simply mean covering the cable with any kind of oil or grease. A proper lubricant will not only protect the outer wires against the action of moisture, acids, etc., but will also work in between the wires and the hemp center, protecting them and providing lubrication.

PIERCING HOLES IN BRASS PART

F. K. A.—We would like to know the best method of piercing or perforating the four 0.098-inch holes in the part shown in the accompanying illustration. The material to be used in making this part is half-hard brass strip stock. It is desirable to avoid, as far as possible, any appreciable bulging of the part at the sides near or adjacent to the holes. The pieces are to be made in large quantities. Can any of MACHINERY'S readers describe a satisfactory method of handling this job?



Brass Part with Four Pierced Holes

Answered by Lewis D. Castor, Elizabeth, N. J.

As a solution to the problem of piercing the holes in the brass part shown, the writer suggests the use of a die of the type illustrated. Besides eliminating bulging while piercing the part, this design of die has the advantage of being easy to operate.

The operation of the die is as follows: When the punch descends, the cams *C* cause the three sliding jaws *B* to clamp the part *A*. Thus the work is held tightly during the piercing operation, the part adjacent to the holes being supported to prevent bulging at these points. When the punch ascends to the top of its stroke, the jaws *B* are disengaged from the cams and are free to return to their normal position, thus permitting the work to be easily removed.

The only function of the pressure pad or stripper *E* is to support the slender punches close to the part, and thus prevent breakage. The pins *G* serve to limit the movement of the jaws. The plate *F* not only acts as a guide for the jaws, but also provides a support to take the thrust of the cams on the downward stroke of the ram.

HARDNESS OF ELECTRO-DEPOSITED COATINGS

V. S. — What is the best method for measuring the hardness of very thin coatings of electro-deposited metals? When so measured, what is the comparative hardness of electro-deposited chromium, nickel, copper, cobalt, tin, and cadmium? How does this hardness compare with the regular hardness of ordinary machinery steel, copper sheets, bronze castings, and rolled brass bars?

These questions are submitted to readers of MACHINERY, who have had experience with this class of work.

PICKLING SOLUTION FOR MONEL METAL

L.A.S.—Will someone kindly give the composition of a pickling bath for removing the scale from monel metal?

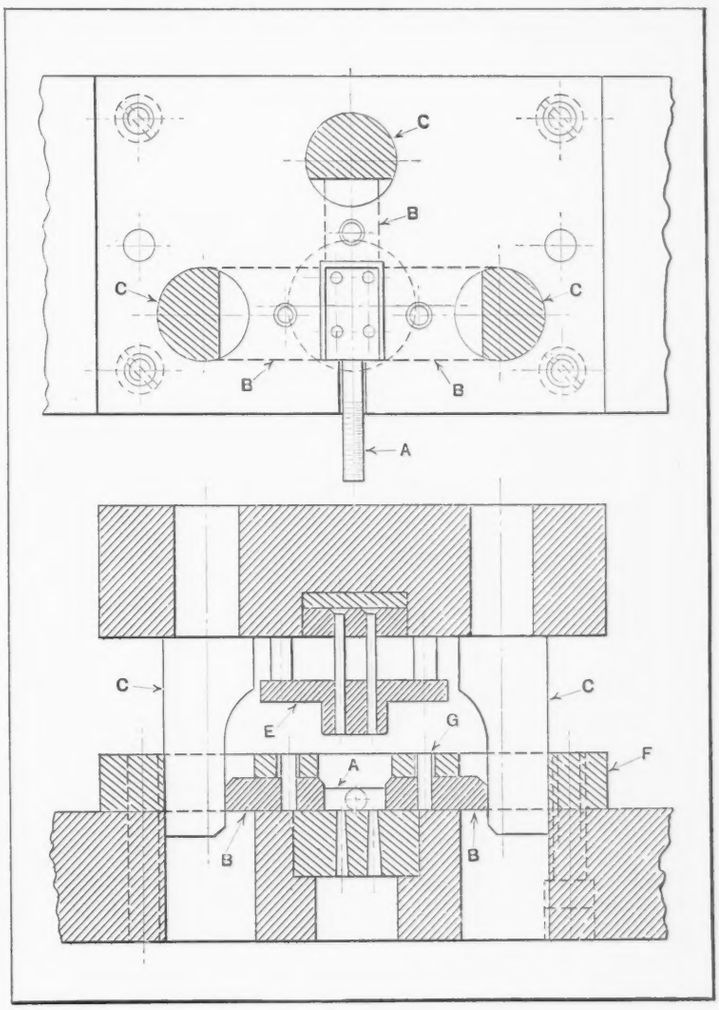
Answered by W. E. Warner, London, England

The ordinary pickling solutions are not effective on monel metal. A special pickling bath which should prove satisfactory is made up from 1.7 pounds of commercial sulphuric acid, 0.7 pound sodium chloride, 0.6 pound sodium nitrate, and 1 gallon of water. When the scale is very heavy, 1 per cent of concentrated nitric acid may be added.

The tank in which the pickling is done must be made of either chemical stoneware or acid-proof brick to resist the corrosive action of the solution. The best temperature at which to keep the bath is about 80 degrees F. At this temperature the pickling will be accomplished in a few hours, the time depending on the thickness of the scale.

* * *

The Leipzig Fall Fair, in progress from August 31 to September 5, comprises 8500 exhibits from twenty-four countries. American manufacturers are represented by more than one hundred exhibits. At the Fall Fair there is no machinery exhibition.



Suggested Design of Die for Piercing Brass Part

Machines for Tungsten-Carbide Tools

A Summary of a Report on the New Cutting Tools Presented before the American Society of Mechanical Engineers

IN July MACHINERY, an abstract was published of a report presented before the Machine Shop Practice Division of the American Society of Mechanical Engineers at the semi-annual meeting of the Society held in Detroit. This report contained specific recommendations for changes in the design of machine tools in order to make possible the most efficient use of tungsten-carbide tools. Quoting from the report:

"Practically all the experiences reported indicate that this new material possesses possibilities for the improvement of machining practices far beyond those already attained, provided further improvement is made in the material and in the tools and machines to withstand the more severe service to which they will be subjected; but there is still much to be done, especially in the design of machines, and a consideration of some of the suggestions that have been submitted for their improvement would not be amiss. The suggestions are as follows:

1. Utmost rigidity of the frame, driving shaft and spindle, tailstock, or other members subjected to strain is essential, in order that deflections shall be extremely small.
2. Large capacity ball bearings, preferably preloaded, or adjustable roller bearings of precision quality should be used for spindles to withstand heavy loads and to eliminate bearing clearances or reduce them to a minimum.
3. Considerably higher speeds are obviously necessary.
4. Greater power should be provided with a large allowance for overload, so that the machine will not stall when cutting.
5. It is important that feeding mechanisms be designed to eliminate 'jumping,' due to the building up and sudden release of pressures on tools.
6. Tool-holders should be heavier and designed to eliminate the overhang of tools, and the method of clamping tools in holders should be improved to insure rigidity.
7. Better provision should be made for handling chips and protecting operators from flying chips."

One manufacturer states that, in general, he believes that standard machine tools made within the last three or four years are sufficiently powerful and have the necessary speed range to use tungsten-carbide tools on work for which they are adapted.

Conclusions Reached by the Committee

In concluding its report, the committee makes the following statement: "Tungsten-carbide tools have been on the market for about a year and a half, but their use on production work is still very limited. A year ago it was thought that the development of tungsten carbide with respect to material and tools would progress much more rapidly than improvements would be made in adapting machines for the use of this material. This does not seem to have been the case. Improvements in the quality of the material and in the efficiency of the tools and machines seem to be advancing together.

The improvement of the machines, however, is a large undertaking and we may expect important changes in design for some time to come. However, a large amount of evidence indicates that for certain classes of work, tungsten-carbide tools can be used with considerable economy on old style machines, provided they are in good condition. These tools are being experimented with by a large number of machine tool users in an endeavor to adapt them to present machine set-ups. We need not expect that the transition from the use of old style machine equipment to the use of highly developed machine equipment, due to the more general adoption of tungsten-carbide tools, will be unduly rapid.

The technique involved in the use of tungsten-carbide tools is quite different from that involved in the use of steel tools, and it will take some time to train shop people in the proper methods of handling, grinding, and setting up tools and machines. The development of this technique is rather expensive, but if the initial applications are made where an appreciable saving can be effected, the cost of further and more difficult applications will be compensated for, at least to some extent. A wide demand for machine equipment from which maximum efficiency can be obtained by the use of tungsten-carbide tools will undoubtedly develop with experience gained from successful and efficient applications on present equipment."

* * *

Many high-grade correspondence schools are filling an important need in our educational system today. Unfortunately, however, their success has induced the starting of correspondence schools that are not equipped to render adequate service. There are even, according to C. J. Ullrich, editor of the *Professional Engineer*—a monthly publication issued by the American Association of Engineers—many fraudulent correspondence schools that claim to be able to provide a young man quickly with sufficient engineering education to enter the engineering profession. The young men are exploited by these schools and expend their money on the courses, misled by the alluring promises that are made in soliciting their enrollment. It is well to investigate the standing of a correspondence school before enrolling.

DROP-HAMMER OF 25,000 POUNDS CAPACITY

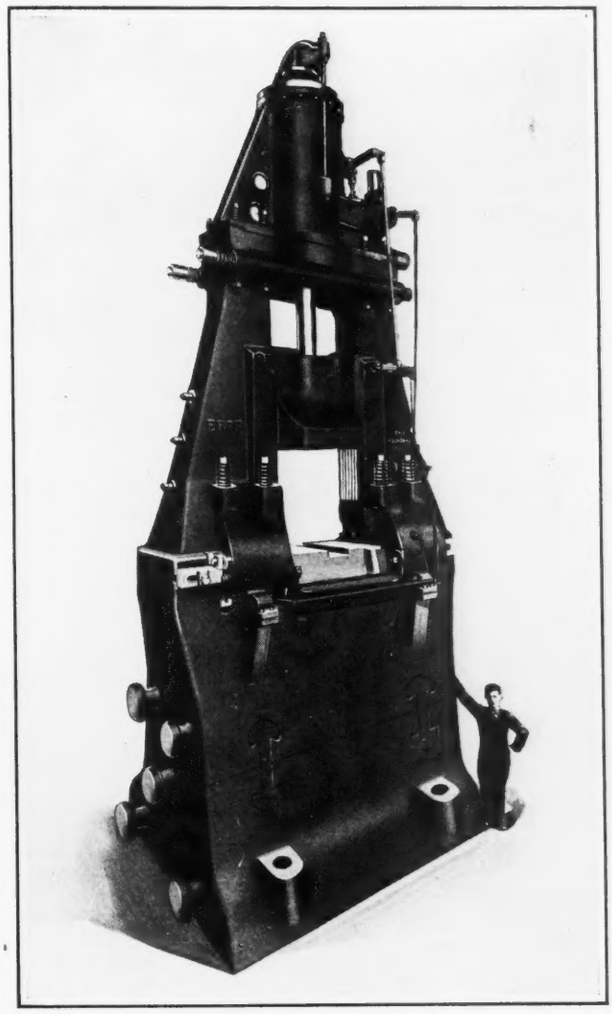
What is believed to be the largest steam drop-hammer ever built was recently constructed by the Erie Foundry Co., Erie, Pa., for the Henry Vogt Machine Co., Louisville, Ky. Although this hammer is rated at 25,000 pounds, the actual weight of the ram, rod, and piston is 27,000 pounds. The machine is 35 feet 6 inches high.

The sow block measures 60 inches from front to back, the die space in the clear between the guides is 52 inches, and the ram measures 54 inches from front to back. This giant hammer has a 32-inch cylinder and a piston-rod 11 inches in diameter. The enormous anvil block weighs 250 tons. It is made in two parts.

This hammer has produced one of the largest die forgings ever made—an 8-inch flanged gate valve which was forged from a billet weighing 2000 pounds. The finished forging weighed 1750 pounds. Its overall length was 31 1/2 inches, height 24 inches, and diameter of flange, 18 1/2 inches.

* * *

While the domestic machinery business has been comparatively quiet this year, exports of industrial machinery have continued to show an increase over 1929. According to the Industrial Machinery Division of the Department of Commerce, the exports for the first six months of 1930 were valued at over $132,000,000, as compared with $126,000,000 for the corresponding period in 1929. The gain was mainly in metal-working, construction, oil-well, and oil-refinery machinery.



Steam Drop-hammer 35 Feet 6 Inches High, Having a Rated Capacity of 25,000 Pounds

The exports of metal-working machinery in June were valued at $3,898,000, as compared with $3,807,000 in the corresponding month last year. The total exports for the six months ending June 30 amounted to $25,644,000, as compared with $21,032,000 for the same period in 1929.

The increases in exports of machine tools and other metal-working machinery were especially noticeable in drilling machines (91 per cent), forging machines (54 per cent), milling machines (47 per cent), lathes (22 per cent).

NEW SELF-LUBRICATING BEARING METAL

A new self-lubricating bearing metal for use in electric motors which turn only a few revolutions and then are idle for a considerable time has been developed by W. C. Wilharm of the Westinghouse Research Laboratories. This new bearing metal can also be used for lubricated bearings to replace present oil-requiring bearing materials. If the film of lubricant becomes inadequate for any reason, the bearing metal is capable of resisting the heating action of friction for a considerable length of time because of its self-lubricating qualities. It is expected that the new bearing metal will find applications both in delicate instruments and devices—such as microscopes, telescopes, calculating machines, and typewriters—and in larger machines.

This bearing metal is made from a composition of numerous metallic and non-metallic substances, and is manufactured by the application of tremendous pressure and high heat. The ingredients are first put in a cold mold and subjected to a pressure of 40,000 pounds per square inch. The temperature is then raised to 400 degrees F. After keeping the mold at this temperature for half an hour, the pressure is raised to 200,000 pounds per square inch. The bearings can be made in molds to given specifications or they can be produced in blank and machined to size.

* * *

BORING HEAD FOR MILLING MACHINES

By C. M. COLE

In June MACHINERY, page 790, a boring head for milling machines is described. A similar boring head is available on the market that has all the advantages of the one described, in addition to some others. This head is made by the Warner & Swasey Co., Cleveland, Ohio, primarily for use on turret lathes for facing, adjustable boring, counterboring, or recessing; but it can also be used in a milling machine for performing the same operations. In one large precision tool-room, all the jig boring machines are equipped with this tool.

Using the Factory Roof for Recreation

How One Concern Provides for the Health and Comfort of its Employes by Utilizing Space that is Ordinarily Wasted

MOST industrial executives realize that recreational activities during lunch periods improve the health of employes and make them more contented, as well as increasing their working capacity. The perplexing problem, however, is to provide space for such activities, especially if the plant is located in a large city and space is at a premium.

When the Allen-Bradley Co. put up its new building several years ago in a busy section of Milwaukee, this problem was solved by setting aside the roof for recreational purposes. Here the workers may enjoy the breezes of Lake Michigan on pleasant days, eight stories above the street level, where they get a fine view of the city and the lake.

Steamer chairs and swings are provided, and there is ample space for playing games. Equipment has been installed at one end of the roof which enables four persons to practice driving golf balls at one time. The building is constructed in the shape of a right angle, less than one-half of the roof area being visible in the heading illustration. The total area is about 11,000 square feet.

As all days are not suitable for outdoor recreation, a luxuriously furnished club room has been provided at the intersection of the two roof wings. The floor is covered with a thick carpet, except at one end which is left bare for dancing. There is a stone fireplace at the opposite end in which a fire blazes during the winter months. A moose head adorns the wall space above the fireplace.

The ceiling is beamed, and the wall panelled with woodwork, stained walnut, while the lighting fixtures are of an artistic wrought-iron design and are equipped with amber bulbs. Heavy velvet draperies extend from the top of the windows to the floor. Plenty of easy chairs are provided and there are magazines to read. Not only are card tables furnished, but playing cards as well. There is a piano and a high-class radio receiving set. This room measures approximately 35 by 65 feet. Employes eat their lunches in the shop, but they can purchase ice cream and candy in a "store" adjacent to the club room.

Since the photograph reproduced in the heading illustration was taken, a solarium has been erected on the roof of the club room, where the men can take sun baths.

The question may naturally arise: "Do the employes really make use of these facilities?" This can be answered decidedly in the affirmative. When the plant is operating with a force of 1100 employes, as many as 350 will be found on the roof on a summer day.

The executives of the Allen-Bradley Co. are convinced that it pays to provide employes with convenient recreation facilities. While the club room is available at night for various functions, such as dances and foremen's get-together dinners, its main purpose is for noontime recreation.

The British Metal-working Industries

From MACHINERY's Special Correspondent

London, August 16

The quiet conditions that have prevailed in the metal-working industries for some time have not been improved by the vacation period, which, under normal circumstances, has an adverse effect upon trade in general. The unemployment figures recently recorded are high. In considering these figures as a barometer of industrial conditions, however, it must be borne in mind that the methods in progress for increasing the efficiency of industry have thrown a large number of people out of employment.

It is generally anticipated that the last quarter of the year will mark some improvement, partly due to the fact that the automobile industry, which contributes largely toward the activity of a number of trades, will enter upon its new season production schedules in the autumn.

The Machine Tool Industry is Marking Time

At present, owing mainly to seasonal influences, machine tool manufacturers are marking time. Prior to the vacation season, the majority of firms experienced a fairly steady flow of orders and the present lull is welcomed by some as an opportunity to clear up outstanding orders.

The general overhauling and renewal of equipment which invariably attends the introduction of new designs in the automobile industry offers encouraging prospects for the near future. Several large contracts have already been placed with machine tool manufacturers for standard type machines of the latest design, together with equipment especially adapted for automobile construction.

The June machine tool exports were 1018 tons, while the April and May figures were 1010 and 1442 tons, respectively. The corresponding values were £128,160, £140,130, and £196,720. The import tonnage figures were: June, 803 tons; April, 972 tons; and May, 1239 tons. The corresponding values were: £135,621, £157,445, and £164,612.

The Automobile Industry is Engaged in Planning New Production Schedules

The majority of automobile manufacturers are at present taking advantage of the transition period from one season to another in order to develop their future production plans and, consequently, evidence rather less activity than usual. Austria offers an encouraging prospect for new business and efforts are being made to stimulate the demand from the Colonies. The recent successes of Coventry-built motorcycles in the trials at the Isle of Man and in Germany should increase the demand for certain makes.

In This Large Club Room, Erected on Top of a Seven-story Building, the Employes of the Allen-Bradley Co., of Milwaukee, Find Rest and Recreation During the Noon Hour

The Macrome Process of Steel Treatment

A New Process Developed in England that Promises to Increase Greatly the Efficiency of Cutting Tools Made from Carbon and High-Speed Steel

A NEW British process for increasing the cutting qualities of steel tools, known as the Macrome process, was mentioned briefly in February MACHINERY, on page 475. Since then additional information has become available on this process, which is now controlled by the Macrome Steel Products, 50 Summer Row, Birmingham, England.

Briefly, the claim made for the new process is that it imparts to cutting tools made from steel increased length of life and greater ability to stand up under heavy pressures, because of the toughening effect produced throughout the whole structure of the material. As yet, very little technical information regarding the process is available, but it is stated definitely that it is not a hardening process, but a treatment that is added to the usual heat-treatment of the steel.

The New Process Does Not Cause Any Distortion of the Tools

It is further stated that no chemical material is either added or taken away from the steel, nor are its chemical contents altered. The effect of the new treatment is said to be permanent, but can be removed by subsequent heat-treatment. The process is carried out at low temperature, so that no distortion takes place in the tools and there is no likelihood of cracks or fractures.

What seems rather paradoxical in the results obtained with this process is that the treated tools do not show any marked improvement when subjected to ordinary physical tests; but under actual working conditions, they show improved endurance and strength.

According to several firms of high standing in Great Britain who have carried out tests with Macromized tools, the process has been found to produce, on an average, an increased life of from 25 per cent, in the case of low-carbon steels, up to 300 per cent, in the case of high-speed steels. The process increases the life between grinds of the treated steel, but does not make the tool suitable for operation at increased feeds and speeds.

The General Principle Involved in the Treatment

So little has been disclosed as to the actual procedure followed in the application of the process that it is difficult even to give an outline of the essentials of the process. Briefly, however, it is known that the treatment consists essentially of a low-temperature preheating of the tools in a closed chamber containing a medium or gas, the nature of which has not been made public. The required temperature varies with the composition of the steel to be treated. Either gas or electric heat is satisfactory. When the required temperature has been reached, an electric current with a given voltage and amperage is applied to the charge of tools in the furnace.

The process is said to be simple, and can be carried out by an unskilled operator when the requirements as to temperature and current required for a particular brand of steel have once been ascertained. The treatment, it is said, has already been standardized for most steels in general use. The cost of the process is claimed to be small.

Some of the Results that have been Obtained

The process has been successfully applied to milling cutters, files, broaches, hacksaw blades, mining tools, and various other steel tools and parts. In the following paragraphs are given the results obtained by several prominent British manufacturers:

An automobile gear manufacturer has found that twice as many gears can be broached with Macromized broaches as with the ordinary type. The same increase in life has also been found to apply to reamers. In another plant, turning tools have lasted six times as long between grindings as untreated tools. In a tool manufacturing plant, drills and other cutting tools tested showed double the life formerly recorded. An automobile manufacturer who has used twenty-four different types of Macromized tools states that they have had from two to three times the life between grindings of untreated tools made from the same kind of steel.

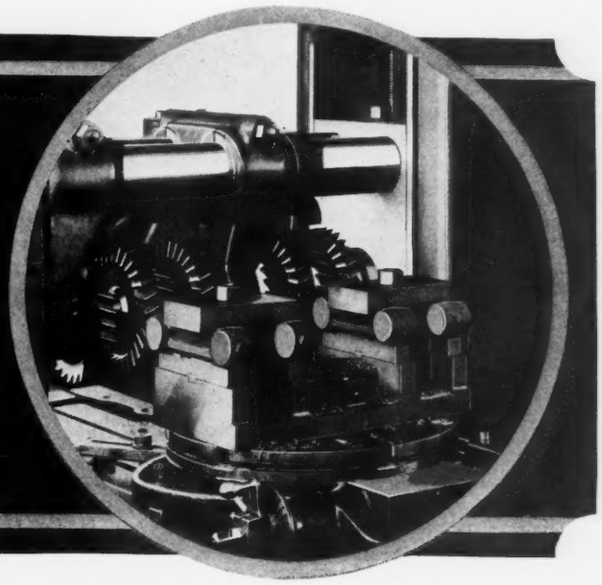
A milling cutter made from 14 per cent tungsten high-speed steel, working at a speed of 60 revolutions per minute, a feed of 3 inches per minute, and a depth of cut of about 7/16 inch, would mill a length of cut equivalent to 136 inches before regrinding became necessary. With the speed increased to 76 revolutions per minute, the feed to 3 3/4 inches per minute, and the depth of cut remaining the same, the same cutter, Macromized, cut 768 inches without regrinding, and is said not to require regrinding even yet.

A number of similar experiences with tools of different kinds are on record, but what has been said is sufficient to indicate that the new process probably offers a worthwhile means of increasing the cutting durability of tool and high-speed steels.

The plan for making the process available to the industry at large appears to be to construct Macromizing plants for installation in shops that acquire the rights to make use of the process. The work of installing the process in manufacturing plants will be in the hands of A. C. Wickman, Ltd., Coventry, England.

New Shop Equipment

Latest Developments in Metal-working Machines, Small Tools, and Work-handling Appliances



CINCINNATI OPEN-SIDE PLANER OF UNUSUAL SIZE

One of the largest open-side planers ever built in the United States was recently constructed by the Cincinnati Planer Co., Cincinnati, Ohio. This machine has a capacity of 96 inches underneath the rail, and the left-hand head can plane down the side of castings 125 inches wide.

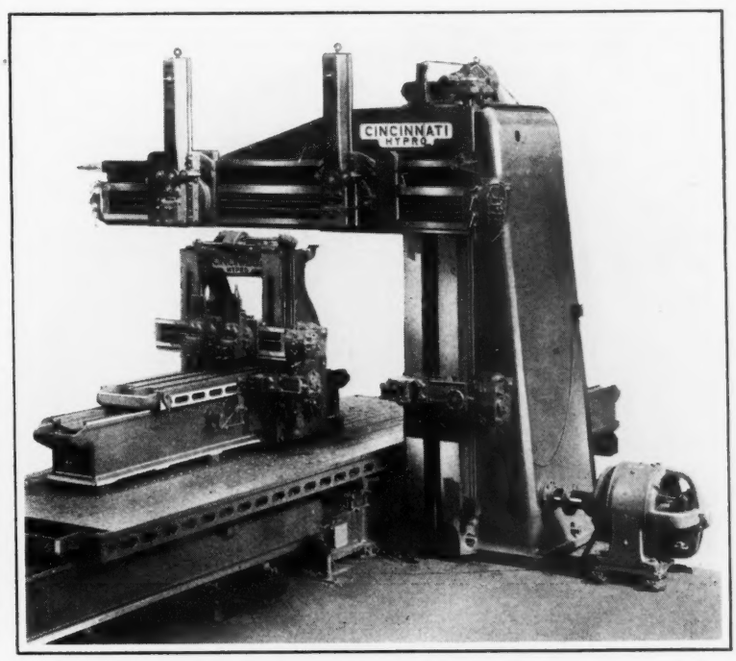
The planer operation is completely controlled by push-buttons. All the heads are controlled by push-buttons located on the right-hand end of the rail and on the side-head. A pendant switch is also supplied. These facilities give the operator convenient control of the table and head movements and of the raising and lowering of the rail.

The rail is clamped to the uprights by means of an electric torque motor which is also operated through a push-button. Power for raising and lowering the rail is provided by another motor. These two small motors are so interlocked that it is impossible to raise or lower the rail when it is clamped or partially clamped. Red lights located at both ends of the rail show whether the rail is clamped or not. These lights can easily be seen by the operator from any position in front of the machine.

When the heads are being operated by means of the rapid traverse, they can be moved independently of each other and can be run against each other without causing any damage. The slides have a down feed of 40 inches below the bottom of the rail. Special tool-holders are provided to permit planing in pockets located any distance below the bottom of the rail, within the capacity of the machine.

Complete lubrication of the machine ways, gearing, heads, and other moving units is insured by means of a pump. All castings used in the construction of the planer are unusually heavy, thus providing sufficient rigidity when planing with the left-hand head at the extreme left-hand end of the rail.

The approximate weight of this machine is 235,000 pounds, the main upright alone weighing about 60,000 pounds.



Cincinnati Open-side Planer, the Capacity of which can be Judged by the Size of a 36-inch Planer Placed on its Table

BRADFORD THREE-HEAD DRILLING AND REAMING MACHINE

A three-head machine developed by the Bradford Machine Tool Co., 659 Evans St., Cincinnati, Ohio, is shown in the accompanying illustration provided with special tooling equipment for operations on the pump body of an electric refrigerator. The tooling equipment comprises four work-holding fixtures which are mounted on a hand-operated turret. One station of the turret is used for reloading, and the other three stations are employed for drilling, counterboring, and reaming operations. The horizontal units drill single holes, while the vertical head is equipped with a cluster box carrying three groups of tools for operations at each of the three stations.

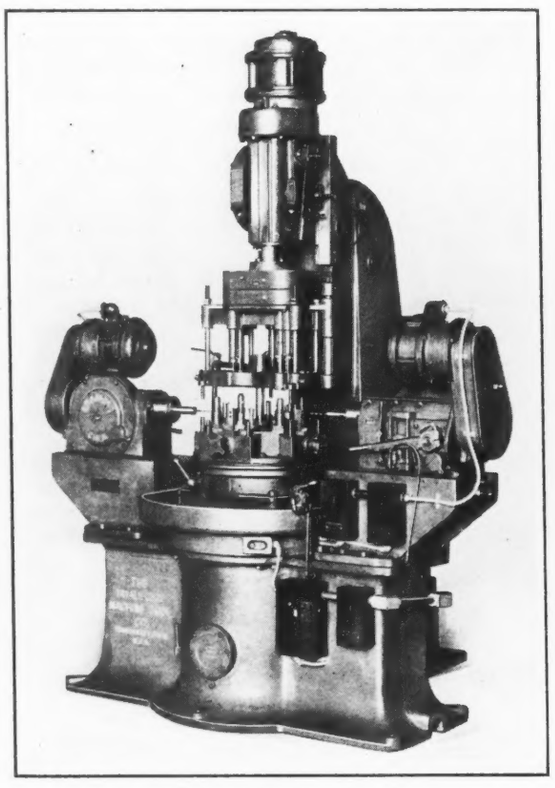
The vertical unit drills ten holes simultaneously, ranging from 0.281 to 0.372 inch in diameter, reams two of them, and counterbores two others to a depth of 0.258 inch. These holes are drilled through S.A.E. 1020 steel, 1 1/4 inches thick. The horizontal units drill two 1/4-inch holes through 3/4-inch stock. The floor-to-floor time is nineteen seconds per piece.

This machine can be readily adapted for general production work by changing the tooling equipment. Multiple-spindle cluster boxes can be mounted on the horizontal units as well, and the turret may be arranged for automatic indexing. Each unit is equipped with an individual motor drive, and there is an additional motor for the pump of the coolant system. The motors are provided with independent switches having overload and underload protection. Starting and stopping of the entire machine are controlled through a single push-button.

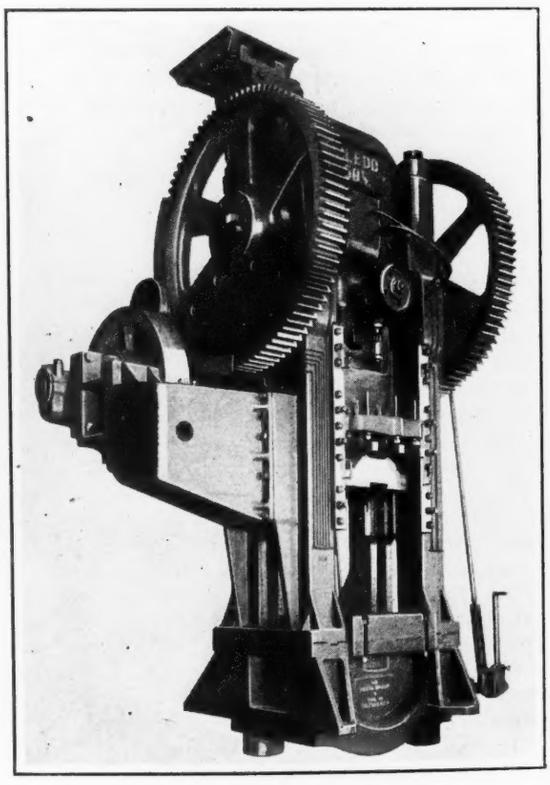
The feeding mechanism is controlled by a hand-operated poppet valve near the front of the table, which connects air-operated trip-dogs attached to the feeding levers of each unit. All spindles advance at a rapid traverse rate, automatically slow down to the proper feed, and then return at the rapid traverse rate to the starting point.

TOLEDO TWIN-GEAR STRAIGHT-COLUMN PRESS

A large straight-column press, primarily intended for heavy forming, flattening, and embossing operations, has recently been built by the Toledo Machine & Tool Co., Toledo, Ohio. With a view to obtaining maximum rigidity, the frame is made comparatively narrow, measuring only 43 inches between uprights. The crankshaft is of the "semi-eccentric" type. It is 13 inches in diameter at the frame bearings and 20 inches in diameter at the crankpin connection. The stroke is 16 inches.



Bradford Three-head Machine for Operations on Refrigerator Pump Bodies



Toledo Press for Heavy Forming, Flattening, and Embossing Operations

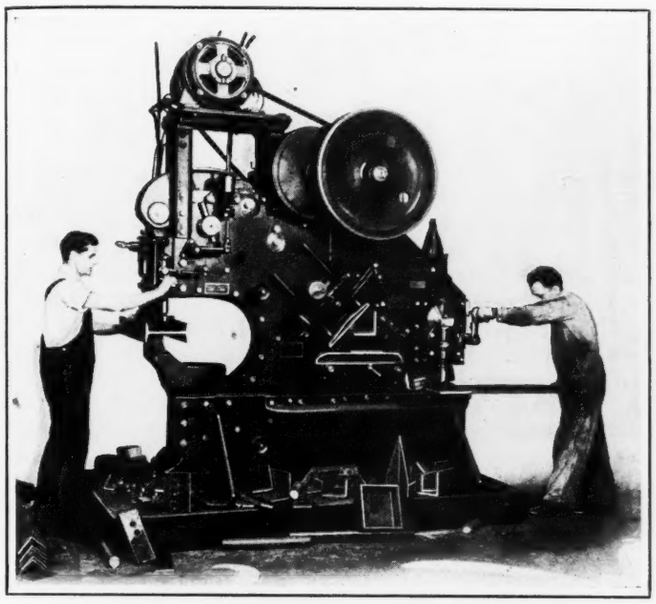


Fig. 1. Pels Combination Shear and Punch for Large Structural Work

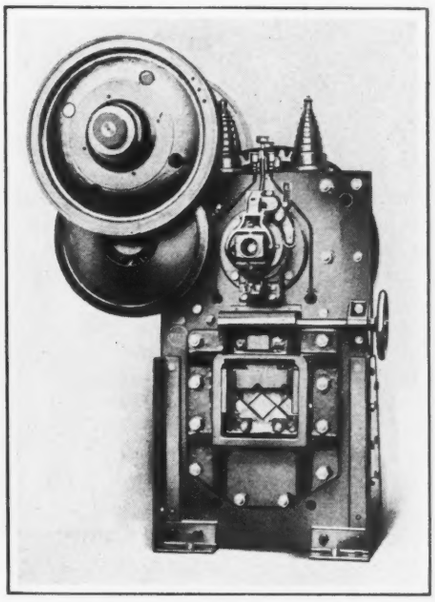


Fig. 2. Small Size of Bar and Billet Shear

The slide measures 35 inches from right to left and 39 inches from front to back. It is equipped with a three-bar, direct-acting knock-out for removing the work from the punch. The slide adjustment of 6 inches is effected by means of a power elevator, which is mounted on the front of the slide, together with its motor.

Another feature of the machine is the compact arrangement of the gearing. The friction clutch is integral with the flywheel, and the latter is mounted on Timken tapered roller bearings, being the only moving part when the press is not in operation. The brake is of an improved clam shell type and is independent of the clutch, thus preventing the clutch from heating up.

The hand-lever for operating the clutch is fitted with a special attachment which permits of starting or stopping the press at will. By simply changing the position of a small stud at the bottom of the hand-lever, the press is made to stop automatically at the top center.

Lubrication is furnished to all bearings through individual pipes, by means of a foot-operated grease gun. The press is operated by a 50-horsepower motor, which is mounted on top of the machine and is belted direct to the flywheel. The press weighs about 160,000 pounds.

PELS SHEARING AND PUNCHING MACHINES

Holes up to 1 inch in diameter can be punched through 1-inch steel by the combination shear and punch illustrated in Fig. 1. This machine is a recent development of Henry Pels & Co., Berlin-Charlottenburg, Germany, which concern maintains an office at 90 West St., New York City.

The machine has been designed primarily to meet requirements in handling large structural work. It has a throat depth of 24 inches and a throat height sufficient to handle Bethlehem beams up to 30 inches. The webs and flanges of Carnegie CB sections up to 36 inches in height and 16 inches in flange width can also be punched. Angle-irons up to 6 by 6 by 5/8 inch can be cut square, and up to 4 by 4 by 1/2 inch to a miter. Plates up to 3/4 inch can be sheared, and up to 7/8 inch, trimmed. Bars up to 5 1/2 by 7/8 inch can be cut with one stroke. The machine has a net weight of 9200 pounds.

Two comparatively small sizes have been added to the line of heavy bar and billet shears also built by the concern. These machines are of the construction shown in Fig. 2. One size will shear cold 4-inch round bars of steel having a tensile strength of 65,000 pounds per square inch, 3 1/2-inch square bars, and 13- by 1 3/8-inch flat bars, while the other size will shear 4 1/4-inch round bars, 4-inch square bars and 14- by 1 1/2-inch flat bars. The machines have a net weight of 12,100 and 15,400 pounds, respectively.

CINCINNATI VERTICAL BORING MILL

The 10-foot vertical boring mill built by the Cincinnati Planer Co., Cincinnati, Ohio, has recently been redesigned. The table is now driven by an internal spur gear, which, in turn, is driven by hardened spiral bevel gears. These spiral bevel

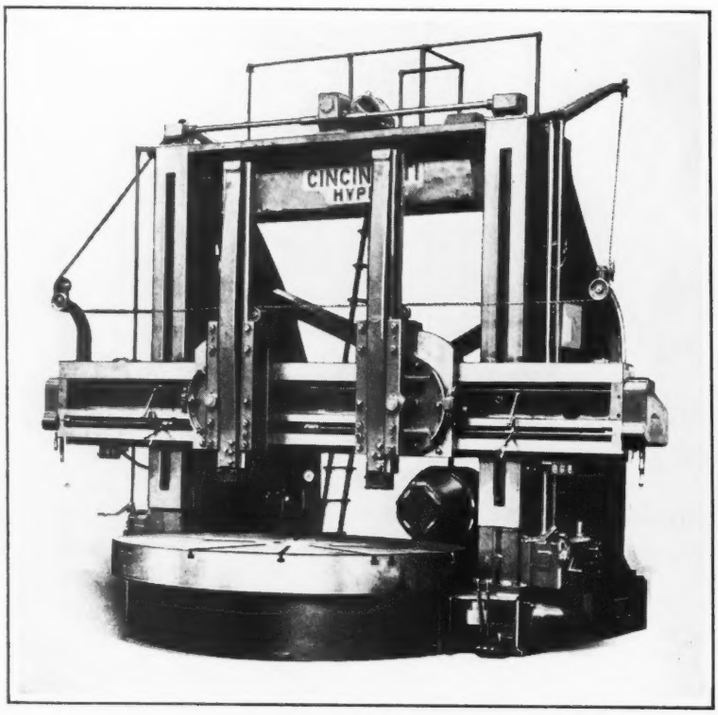


Fig. 1. Cincinnati Boring Mill Recently Redesigned

gears are mounted in ball bearings to insure a smooth rolling action of the gears and table. Oil is circulated to the table track, spindle, and speed-box by means of a pump. A gage mounted in a conspicuous place tells the operator at a glance whether or not the oil system is functioning.

The speed-box is mounted between the base extensions, as illustrated in Fig. 2, and is driven by either a variable- or a constant-speed motor. With a variable-speed motor, a four-speed gear-box is supplied, and with a constant-speed motor, a nine-speed gear-box. The drive from the motor to the speed-box is delivered through herringbone gears.

The movement of the heads is controlled by means of push-buttons. The heads are independent of each other, being actuated by separate motors mounted on the ends of the rail, as illustrated in Fig. 3. These motors are so arranged that, by shifting a lever, either the rapid traverse or the feed to the corresponding head can be obtained. The arrangement reduces the amount of mechanism required on top of the boring mill.

The rail is raised and lowered by a motor located on top of the machine, which is also controlled through a push-button. It is impossible to raise or lower the rail when it is either entirely or partially clamped. With the new method of control, it is possible for the operator, from his working position, to change feeds and speeds, raise or lower the rail, and clamp or unclamp the rail.

The boring mills of the complete line built by this concern are now designed similarly. Side-heads can be supplied if desired.

ZEH & HAHNEMANN DOUBLE CRANK PRESS

For blanking small parts, such as transformer laminations, in large quantities, the Zeh & Hahnemann Co., 182-200 Vanderpool St., Newark, N. J., has brought out the double crank power press illustrated. This machine is equipped with an automatic roll feed that enables sheets to be used without being

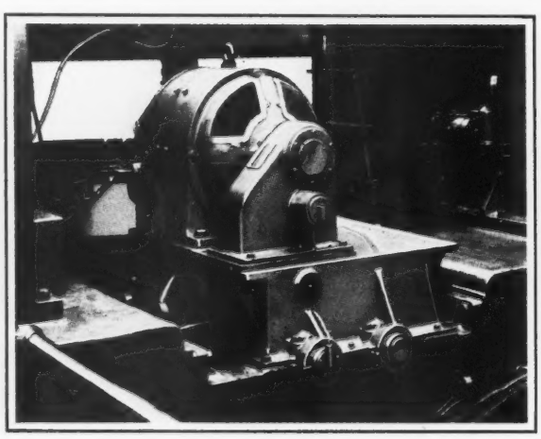


Fig. 2. Arrangement of the Speed-box and Table Drive Motor

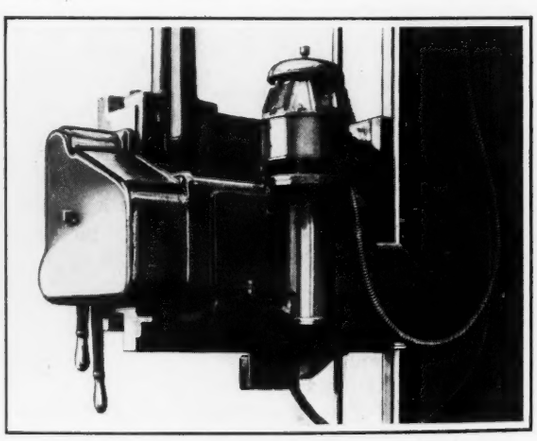


Fig. 3. Motor for the Right-hand Head Installed on Back of Rail

MACHINERY'S DATA SHEETS 185 and 186

HELIX ANGLES FOR SCREW THREADS—1

Diameter, Inches	Threads per Inch													
	36	32	28	26	24	22	20	18	16	14	13	12	11 1/2	11
	Helix Angles (Degrees and Minutes) Based on the Pitch Diameters													
3/16	2°–59′	3°–24′	3°–57′	4°–19′	4°–44′	5°–14′	5°–52′	6°–40′	7°–43′	.....	.....	.....	.....	.....
1/4	2°–11′	2°–29′	2°–52′	3°–7′	3°–24′	3°–45′	4°–11′	4°–44′	5°–26′	6°–22′	6°–59′	.....	.....	.....
5/16	1°–43′	1°–57′	2°–15′	2°–26′	2°–40′	2°–56′	3°–15′	3°–40′	4°–11′	4°–53′	5°–20′	5°–52′	.....	.....
3/8	1°–25′	1°–36′	1°–51′	2°–00′	2°–11′	2°–24′	2°–40′	2°–59′	3°–24′	3°–57′	4°–19′	4°–44′	.....	.....
7/16	1°–12′	1°–22′	1°–34′	1°–42′	1°–51′	2°–2′	2°–15′	2°–31′	2°–52′	3°–20′	3°–37′	3°–57′	.....	4°–22′
1/2	1°–3′	1°–11′	1°–22′	1°–29′	1°–36′	1°–46′	1°–57′	2°–11′	2°–29′	2°–52′	3°–7′	3°–24′	.....	3°–45′
9/16	0°–56′	1°–3′	1°–12′	1°–18′	1°–25′	1°–33′	1°–43′	1°–55′	2°–11′	2°–31′	2°–44′	2°–59′	.....	3°–17′
5/8	0°–50′	0°–57′	1°–5′	1°–10′	1°–16′	1°–23′	1°–32′	1°–43′	1°–57′	2°–15′	2°–26′	2°–40′	.....	2°–56′
3/4	0°–42′	0°–47′	0°–54′	0°–58′	1°–3′	1°–9′	1°–16′	1°–25′	1°–36′	1°–51′	2°–00′	2°–11′	2°–17′	2°–24′
7/8	0°–35′	0°–40′	0°–46′	0°–50′	0°–54′	0°–59′	1°–5′	1°–12′	1°–22′	1°–34′	1°–42′	1°–51′	1°–56′	2°–2′
1	0°–31′	0°–35′	0°–40′	0°–43′	0°–47′	0°–51′	0°–57′	1°–3′	1°–11′	1°–22′	1°–29′	1°–36′	1°–41′	1°–46′
1 1/8	0°–27′	0°–31′	0°–35′	0°–38′	0°–42′	0°–45′	0°–50′	0°–56′	1°–3′	1°–12′	1°–18′	1°–25′	1°–29′	1°–33′
1 1/4	0°–25′	0°–28′	0°–32′	0°–34′	0°–37′	0°–41′	0°–45′	0°–50′	0°–57′	1°–5′	1°–10′	1°–16′	1°–20′	1°–23′
1 3/8	0°–22′	0°–25′	0°–29′	0°–31′	0°–34′	0°–37′	0°–41′	0°–45′	0°–51′	0°–59′	1°–4′	1°–9′	1°–12′	1°–16′
1 1/2	0°–21′	0°–23′	0°–26′	0°–29′	0°–31′	0°–34′	0°–37′	0°–42′	0°–47′	0°–54′	0°–58′	1°–3′	1°–6′	1°–9′
1 5/8	0°–19′	0°–21′	0°–24′	0°–26′	0°–29′	0°–31′	0°–34′	0°–38′	0°–43′	0°–49′	0°–53′	0°–58′	1°–1′	1°–3′
1 3/4	0°–18′	0°–20′	0°–23′	0°–24′	0°–26′	0°–29′	0°–32′	0°–35′	0°–40′	0°–46′	0°–49′	0°–54′	0°–56′	0°–59′
1 7/8	0°–16′	0°–18′	0°–21′	0°–23′	0°–25′	0°–27′	0°–30′	0°–33′	0°–37′	0°–43′	0°–46′	0°–50′	0°–52′	0°–55′
2	0°–15′	0°–17′	0°–20′	0°–21′	0°–23′	0°–25′	0°–28′	0°–31′	0°–35′	0°–40′	0°–43′	0°–47′	0°–49′	0°–51′
2 1/4	.....	0°–15′	0°–18′	0°–19′	0°–21′	0°–22′	0°–25′	0°–27′	0°–31′	0°–35′	0°–38′	0°–42′	0°–43′	0°–45′
2 1/2	.....	.....	0°–16′	0°–17′	0°–18′	0°–20′	0°–22′	0°–25′	0°–28′	0°–32′	0°–34′	0°–37′	0°–39′	0°–41′
2 3/4	.....	.....	.....	0°–15′	0°–17′	0°–18′	0°–20′	0°–22′	0°–25′	0°–29′	0°–31′	0°–34′	0°–35′	0°–37′
3	.....	.....	.....	.....	0°–15′	0°–17′	0°–18′	0°–21′	0°–23′	0°–26′	0°–29′	0°–31′	0°–32′	0°–34′
3 1/4	.....	.....	.....	.....	0°–14′	0°–15′	0°–17′	0°–19′	0°–21′	0°–24′	0°–26′	0°–29′	0°–30′	0°–31′
3 1/2	.....	.....	.....	.....	0°–13′	0°–14′	0°–16′	0°–18′	0°–20′	0°–23′	0°–24′	0°–26′	0°–28′	0°–29′
3 3/4	.....	.....	.....	.....	0°–12′	0°–13′	0°–15′	0°–16′	0°–18′	0°–21′	0°–23′	0°–25′	0°–26′	0°–27′
4	.....	.....	.....	.....	0°–11′	0°–12′	0°–14′	0°–15′	0°–17′	0°–20′	0°–21′	0°–23′	0°–24′	0°–25′

MACHINERY'S Data Sheet No. 185, New Series, September, 1930 Contributed by F. A. Firnhaber

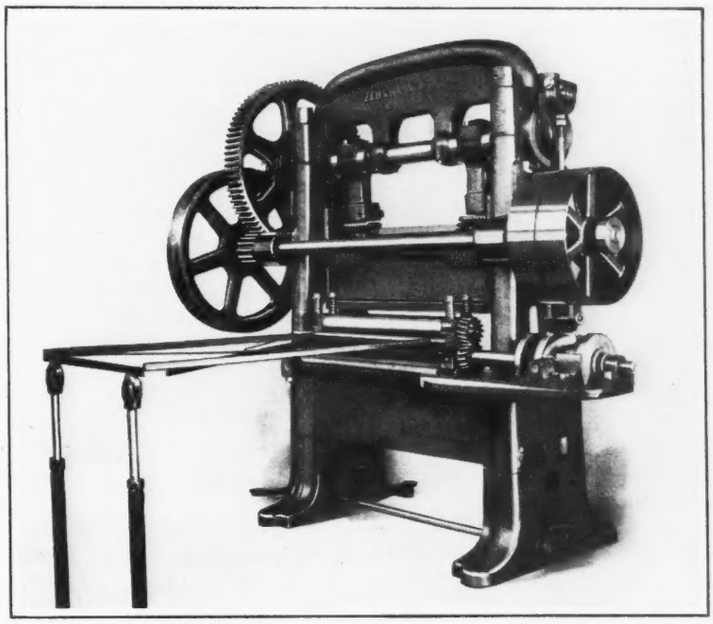
HELIX ANGLES FOR SCREW THREADS—2

Diameter, Inches	Threads per Inch											
	10	9	8	7	6	5 1/2	5	4 1/2	4	3 1/2	3 1/4	3	2
	Helix Angles (Degrees and Minutes) Based on the Pitch Diameters												
7/16	4°–53′	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1/2	4°–11′	4°–44′	5°–26′	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9/16	3°–40′	4°–8′	4°–44′	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5/8	3°–15′	3°–40′	4°–11′	4°–53′	.....	.....	.....	.....	.....	.....	.....	.....	.....
3/4	2°–40′	2°–59′	3°–24′	3°–58′	4°–44′	.....	.....	.....	.....	.....	.....	.....	.....
7/8	2°–15′	2°–31′	2°–52′	3°–20′	3°–58′	4°–22′	4°–53′	.....	.....	.....	.....	.....	.....
1	1°–57′	2°–11′	2°–29′	2°–52′	3°–24′	3°–45′	4°–11′	4°–44′	5°–26′	.....	.....	.....	.....
1 1/8	1°–43′	1°–55′	2°–11′	2°–31′	2°–59′	3°–17′	3°–40′	4°–7′	4°–44′	5°–32′	.....	.....	.....
1 1/4	1°–32′	1°–43′	1°–57′	2°–15′	2°–40′	2°–56′	3°–15′	3°–40′	4°–11′	4°–53′	5°–20′	5°–52′	.....
1 3/8	1°–24′	1°–33′	1°–46′	2°–2′	2°–24′	2°–38′	2°–56′	3°–17′	3°–45′	4°–22′	4°–46′	5°–14′	.....
1 1/2	1°–16′	1°–25′	1°–36′	1°–51′	2°–11′	2°–24′	2°–40′	2°–59′	3°–24′	3°–57′	4°–19′	4°–44′	.....
1 5/8	1°–10′	1°–18′	1°–29′	1°–42′	2°–00′	2°–12′	2°–26′	2°–44′	3°–7′	3°–37′	3°–56′	4°–18′	6°–59′
1 3/4	1°–5′	1°–12′	1°–22′	1°–34′	1°–51′	2°–2′	2°–15′	2°–31′	2°–52′	3°–20′	3°–37′	3°–57′	6°–22′
1 7/8	1°–00′	1°–7′	1°–16′	1°–28′	1°–43′	1°–53′	2°–5′	2°–20′	2°–40′	3°–5′	3°–21′	3°–40′	5°–52′
2	0°–57′	1°–3′	1°–11′	1°–22′	1°–36′	1°–46′	1°–57′	2°–11′	2°–29′	2°–52′	3°–7′	3°–24′	5°–26′
2 1/4	0°–50′	0°–56′	1°–3′	1°–12′	1°–25′	1°–33′	1°–43′	1°–55′	2°–11	2°–31′	2°–44′	2°–59′	4°–44′
2 1/2	0°–45′	0°–50′	0°–57′	1°–5′	1°–16′	1°–24′	1°–32′	1°–43′	1°–57′	2°–15′	2°–26′	2°–40′	4°–11′
2 3/4	0°–41′	0°–45′	0°–51′	0°–59′	1°–9′	1°–16′	1°–24′	1°–33′	1°–46′	2°–2′	2°–12′	2°–24′	3°–45′
3	0°–37′	0°–42′	0°–47′	0°–54′	1°–3′	1°–9′	1°–16′	1°–25′	1°–36′	1°–51′	2°–00′	2°–11′	3°–24′
3 1/4	0°–34′	0°–38′	0°–43′	0°–49′	0°–58′	1°–4′	1°–10′	1°–18′	1°–29′	1°–42′	1°–50′	2°–00′	3°–7′
3 1/2	0°–32′	0°–35′	0°–40′	0°–46′	0°–54′	0°–59′	1°–5′	1°–12′	1°–22′	1°–34′	1°–42′	1°–51′	2°–52′
3 3/4	0°–30′	0°–33′	0°–37′	0°–43′	0°–50′	0°–55′	1°–00′	1°–7′	1°–16′	1°–28′	1°–35′	1°–43′	2°–40′
4	0°–28′	0°–31′	0°–35′	0°–40′	0°–47′	0°–51′	0°–57′	1°–3′	1°–11′	1°–22′	1°–29′	1°–36′	2°–29′

MACHINERY'S Data Sheet No. 186, New Series, September, 1930 Contributed by F. A. Firnhaber

slit previously, thus saving time and reducing waste of material. The feed works on the stagger principle, as follows: Forward, punch; to the right, punch; forward, punch; to the left, punch; and so on.

The machine is arranged for high rates of output, producing 250 blanks per minute. Five dies are used, and the press makes fifty strokes per minute. This equipment weighs 10,000 pounds, yields a pressure of 50 tons, and measures 48 inches between the uprights. It accommodates sheets 36 inches wide by 8 feet long.



Zeh & Hahnemann Press with Automatic Stagger Feed

WELLS THREAD GRINDER

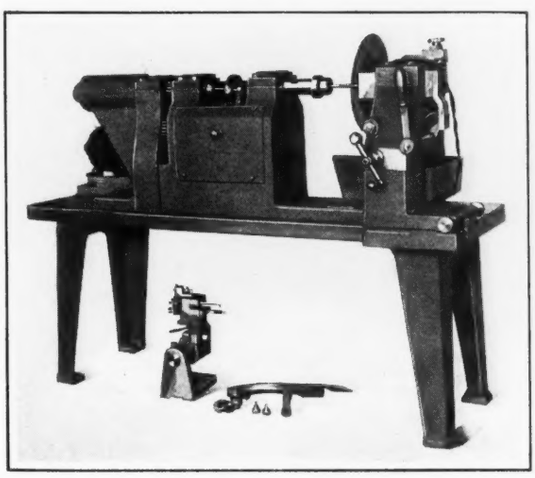
A machine designed especially for grinding taps, thread gages, and other threaded parts within close limits has been brought out by the Wells Mfg. Co., P. O. Box 613, Greenfield, Mass. This machine will accommodate parts up to 2 1/2 inches in diameter with a threaded portion 3 1/2 inches long. Straight or tapered work with either right- or left-hand threads can be ground.

The work is mounted between centers and revolved at a selected speed, being traversed past the grinding wheel at the same time under the control of a lead-screw. Different work-spindle speeds are obtained through change-gears at the rear of the machine. The stroke of this spindle is controlled by adjustable stops.

The grinding wheel is mounted on a motor-driven spindle which can be inclined to the helix angle of the thread being ground. The wheel cuts continuously on both the forward and return passes of the work. A self-contained wheel-truing device with three diamonds is mounted permanently on the table. This device bears a fixed relation to the work, regardless of the angular setting of the wheel. The wheel-truing device is shown beneath the machine in the illustration, together with the wheel guards. This equipment has a weight of about 1400 pounds.

HANNA DIFFERENTIAL-CASE AND CROWN-GEAR RIVETERS

Riveters designed especially for use in the manufacture of differential-case and crown-gear assemblies have recently been



Wells Thread Grinding Machine for Straight or Tapered Work

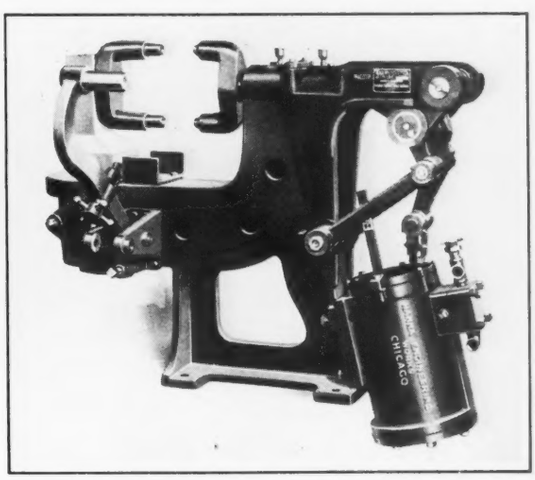


Fig. 1. Hanna Pneumatic Differential-case and Crown-gear Riveter

added to the line of the Hanna Engineering Works, 1763 Elston Ave., Chicago, Ill. On account of the heavy pressure applied to form the rivet heads, these machines are arranged for driving two diametrically opposite rivets at the same time. This feature insures symmetrical clamping of the parts. Another advantage claimed is that the uniformity of the riveting pressure, irrespective of variations in the thickness of the parts joined, produces uniform results and prevents damaging the parts.

Fig. 1 shows a riveter with the dies horizontal. In this equipment, the work is supported on a stud carried by a pivoted arm. Adjustable stops on this arm position the work correctly with respect to the dies when the arm is swung over to the limiting point. This arm furnishes a convenient means for assembling component parts and for supporting them while the rivets are being put in place.

A riveter with the dies vertical is shown in Fig. 2. The work is placed on a central pivot located midway between the two dies, and then swung into the riveting position. This machine embodies a sub-press construction which insures true alignment of the dies despite the deflection in the riveter frame that is inevitable with the heavy pressures employed in compression riveting.

Fig. 3 shows a somewhat similar machine adapted to a wider range of work by the provision of adjustments which enable the dies to be shifted over a considerable range to change the distance between the rivets.

TUNGSTEN-CARBIDE TOOL LAPPING MACHINE

Another model, of the design here illustrated, has been added to the line of diamond tool lapping machines built by the Modern Diamond Tool Co., 1050 Mt. Elliott Ave., Detroit, Mich. As in the case of the machines described in July MACHINERY, page 921, the new machine is equipped with an iron lapping wheel charged with diamond dust. In a lapping operation, this wheel is kept slightly moist with a mixture of olive oil and diamond powder.

Diamond Lapping Machine for Tungsten-carbide Tools

The machine is driven by a 1/2-horsepower motor installed in the base, the lapping wheel

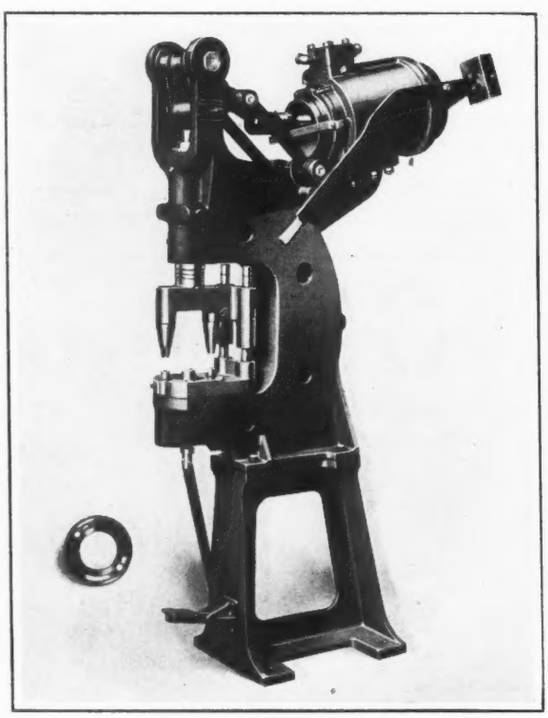


Fig. 2. Riveter with Vertical Dies for the Same Class of Work as the Machine in Fig. 1

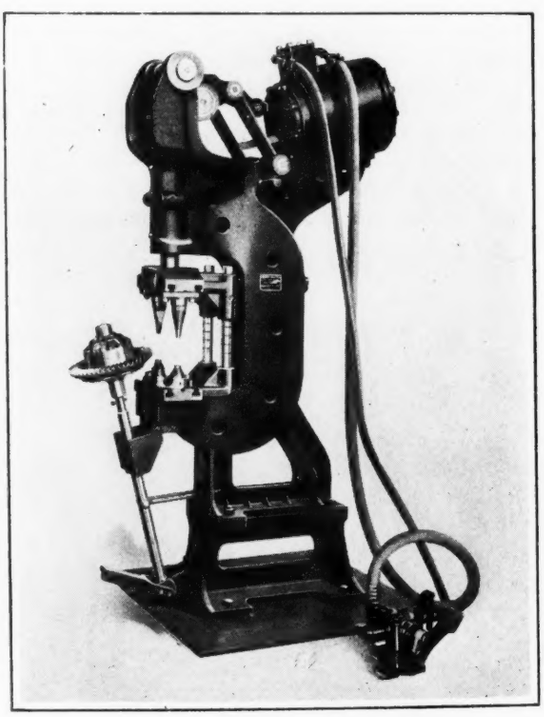
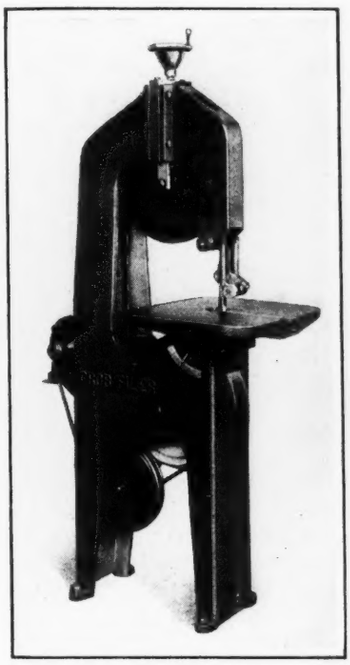


Fig. 3. Riveter with Adjustable Dies for Changing the Distance between Rivets



Grob Continuous Filer

being run at one-half the motor speed. The machine is equipped with an adjustable horizontal slide, a vertical slide, and a platen or work-holder by means of which the tool being lapped can be moved across the periphery or the face of the wheel. There is an angular adjustment for the platen and a gage that facilitates dressing the cutting edge of tools to any angle. This machine weighs about 350 pounds.

GROB CONTINUOUS FILING MACHINE

A filing machine with a continuous cutting action has been developed by Grob Bros., 90th and National Aves., West Allis, Wis., for use in the manufacture of dies, tools, and miscellaneous parts. One of the applications of this machine is the filing of internal surfaces in blanking and trimming dies. For such work, a notched link of the filing chain is disconnected, after which the work is placed in position on the table, the filing chain is drawn through the hole of the die, the notched link is again connected, and tension is placed on the filing chain by a handwheel on top of the machine.

The table measures 16 by 20 inches, and can be tilted 22 1/2 degrees up or down. An indicator finger and scale facilitate accurate settings. The continuous filing chain is made up of a series of links which operate on two sheaves. The driving sheave is located in the base of the machine, and the driven sheave in the head. Files are welded to the links of the chain. Individual links can be replaced conveniently, and the entire chain can be removed from the machine. Power for actuating the filing chain is delivered through a "Texrope" reduction drive. Three speeds—170, 195, and 220 feet per minute—are available.

BLISS SEMI-AUTOMATIC DOUBLE SEAMER

Round drums, pails, tubs, and similar articles up to 22 1/2 inches in diameter and not over No. 18 gage in thickness can be double-seamed in a No. 220 semi-automatic machine recently developed by the E. W. Bliss Co., Brooklyn, N. Y. Two of the im-

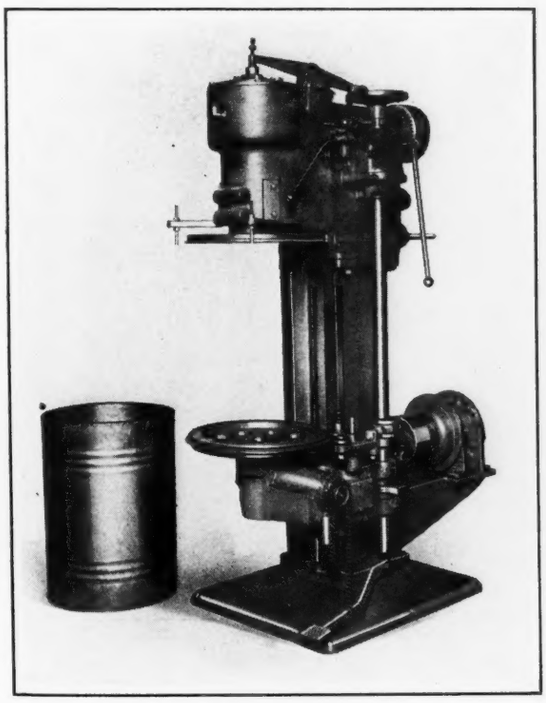


Fig. 1. Bliss Double Seamer with Single-spindle Footstock

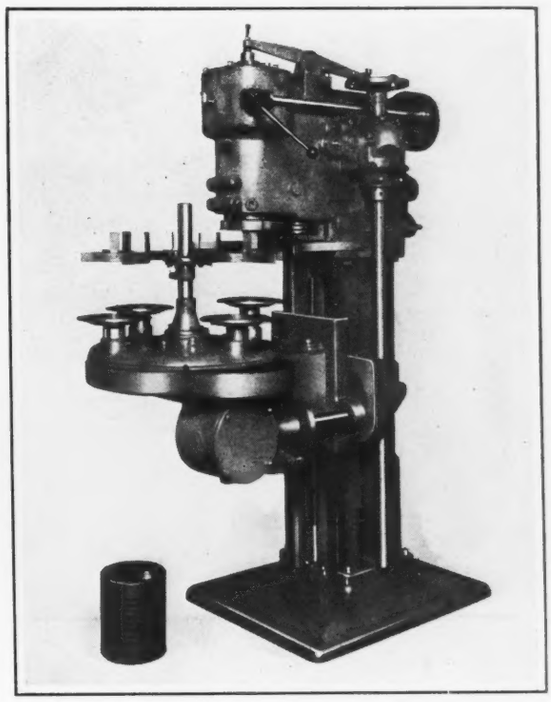


Fig. 2. Double Semi-automatic Seamer with Dial Feed

portant features of this machine are the use of ball and roller bearings and the splash system of lubrication. Three different types are made, as shown in the accompanying illustrations. Each type is composed primarily of a self-contained seaming head supported on a column. The column has a machined front face to which the footstock or work-holding knee can be gibbed.

The Type A machine, shown in Fig. 1, has a single-spindle footstock and is best adapted to limited production, as it can be easily changed from one job to another. It is also intended especially for seaming large thin drums requiring careful assembly of the body and head.

In operation, the work is placed on the bottom chuck and raised by a treadle into firm contact with the revolving top chuck, the friction produced by the latter rotating the work. As soon as the work runs true, the operator trips the feed clutch, after which the operation is automatic. This type of machine takes work up to 22 1/2 inches in diameter by 36 inches high.

Fig. 2 illustrates the Type B machine, which is equipped with a four-station dial feed for work up to 15 1/4 inches in diameter by 26 inches in height. Dial indexing and the rise and fall of the work are effected automatically, and hence the treadle and feed clutch are omitted. Machines of this type may be indexed from twelve to sixteen times per minute.

The Type C machine, shown in Fig. 3, equipped with a six-station dial, will take work up to 18 inches in diameter, and a four-station dial can be provided for work up to 22 1/2 inches in diameter. The height range is from 18 to 36 inches. The dial is built into the base and cannot be adjusted for height, the height range being obtained by means of the vertically adjustable column. The dial of this machine is arranged to index at the rate of twelve times per minute.

FEDERAL SEAM WELDING MACHINES

Seam welding machines ranging in capacity from 50 to 150 kilowatts, and with throat depths of from 24 to 48 inches, are now built in a standard line by the Federal Machine & Welder Co., Warren, Ohio. One of these machines is illustrated below.

These machines are provided with sixteen points of regulation through a separate regulating coil. Pressure is supplied by air through a toggle device equipped with an adjustable spring which gives a fine control. All current-carrying parts are water-cooled. Water is circulated through the shaft holding the upper roll and also around this roll to practically the welding point. The lower roll runs in a water bath.

No magnetic material is used in or near the welding rolls; this construction eliminates heating. Either or both rolls can be driven, according to the type of work. Speeds of from 10 to 30 feet per minute are obtainable on material of from No. 16 to 24 gage.

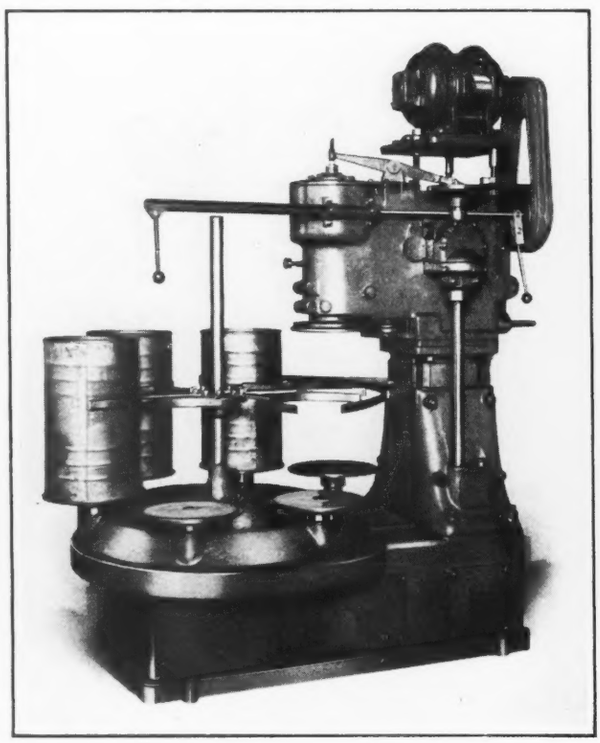
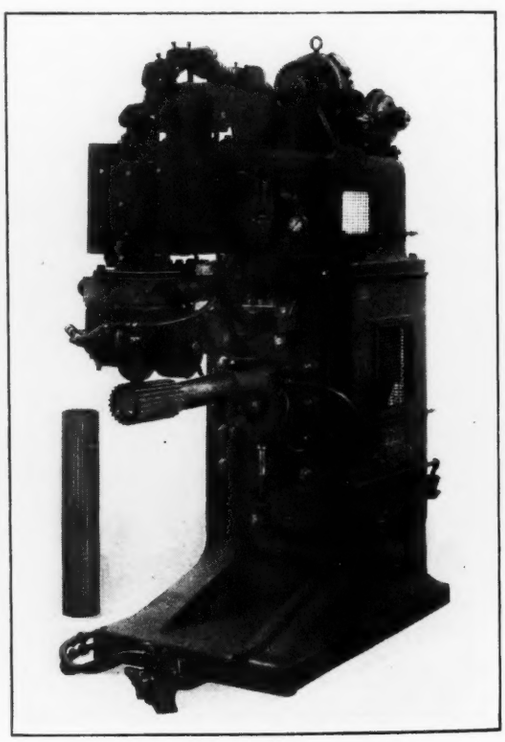
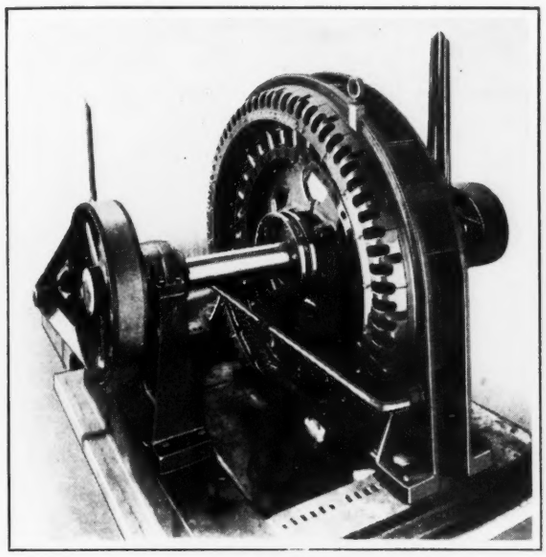


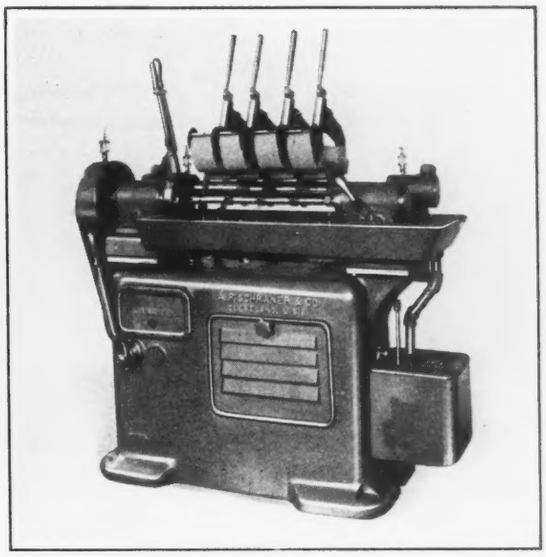
Fig. 3. Seamer with Vertically Adjustable Column



One of a New Line of Federal Seam Welders



Fairbanks-Morse 500-horsepower Synchronous Motor



Schraner Polishing Machine for Straight Shafts

FAIRBANKS-MORSE SYNCHRONOUS MOTORS

Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill., has broadened its line of synchronous motors to include ratings of from 20 to 10,000 horsepower, in low- and high-speed types. These motors are equipped with anti-friction bearings. The stators have cast semi-steel skeleton frame ends of boltless, nutless, and threadless construction. The entire stator core is compressed evenly to the desired pressure by means of a hydraulic press. While under this pressure, the stacking pins are welded to form flat countersunk heads which effectively prevent loosening or shifting of the core laminations.

The starter used is similar to the across-the-line starter employed for small- and medium-sized induction motors, but in addition to the main line magnetically operated line switch and overload relay, there is a relay-actuated automatic field switch. This switch closes the field circuit at a predetermined point as the motor approaches synchronous speed. The switch opens automatically when the motor stops.

SCHRANER SHAFT POLISHING MACHINE

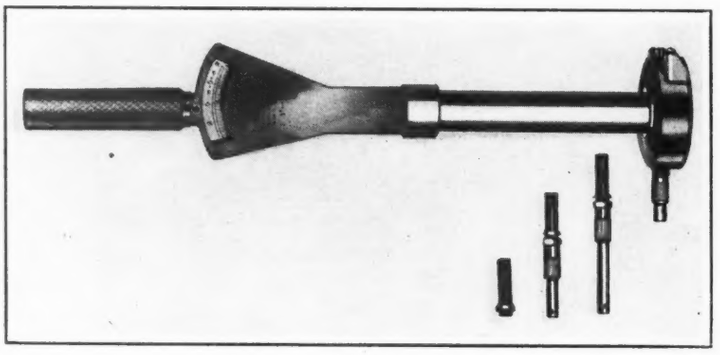
A machine for obtaining the final finish on the bearings of straight shafts, crankshafts, and other cylindrical ground work has been developed by A. P. Schraner & Co., Payne Ave. and E. 33rd St., Cleveland, Ohio. A fine grade of abrasive paper, in conjunction with a mixture of kerosene and oil, is used for obtaining the finish. The appearance of this machine as equipped for straight shaft work may be seen in the illustration.

The base contains the motor, pumps, and a gear-box. A sump for the kerosene wash is attached to one end of the base. The motor is of two horsepower capacity, runs at 1200 revolutions per minute, and transmits the drive, through a gear-box and a silent chain, to the driving head. The machine automatically stops at any predetermined time for which the timing device is set.

The headstock and tailstock are mounted on a platen which oscillates back and forth sideways in operation. Extending along the back of the machine there is a shaft on which the polishing arm carriers are mounted. These carriers can be adjusted laterally to any position. Each arm carries a polishing attachment which consists of a pair of jaws that can be opened for loading and then closed around the work. The jaws are furnished with steel shoes bored to suit the bearings on which they are to work.

Abrasive paper of the proper width is attached in rolls to the back of each polishing attachment. This paper is threaded through the shoes and wound up on reels at the front of the attachments. Each time the attachments are opened for loading a new piece of work, about 1/4 inch of paper is wound up on the reels, so that a small amount of fresh paper is used for each new piece of work.

For straight shaft work, the polishing attachments are stationary, while for crankshafts, the attachments are arranged to follow the throw of the crank arms. The machine is made in various sizes to suit different requirements. Approximately 0.0002 inch of metal is removed to produce a high degree of finish. The time required for finishing a bearing, or all bearings on a shaft, is approximately twenty seconds.



Inside Indicator Gage for Checking Deep Holes

FRONT AND REAR TOOL-BLOCKS FOR REED-PRENTICE LATHES

The Reed-Prentice Corporation, Worcester, Mass., has recently provided the front and rear tool-block constructions shown in Figs. 1 and 2 on lathes built for a machine tool manufacturer. The equipment shown in Fig. 1 consists of a compound rest in front and a plain T-slot block with toolpost at the rear. The rear block is a steel casting and has an independent adjustment on the lower slide.

The compound block is made of steel and has a screw adjustment that gives greater clearance and permits the use of a large crank-handle. This screw may be operated from the usual position or through a shaft mounted at right angles and connected to the screw through bevel gears. The construction does away with any interference between the handles of the compound rest and the cross-feed screw.

Fig. 2 shows a duplicate construction, with the exception that the rear block is provided with a separate screw for adjusting in and out. This construction permits independent operation of the rear tools without disturbing the front tool set-up. The screw has a quick hand feed and micrometer dial for accurately positioning the rear block.

INSIDE INDICATOR GAGE

An inside indicator gage of the construction illustrated has recently been placed on the market by the Swedish Gage Co. of America, Woodward Ave. and E. Grand Blvd., Detroit, Mich. This gage is designed for checking the diameter, taper, and out-of-roundness of deep holes. It is made in two sizes. The No. 5L, shown in the illustration, has been primarily developed for checking cylinder bores in either original manufacture or in later regrinding operations.

The construction of the centralizing mechanism is such that the indicating anvils are always located diametrically opposite so as to insure accurate readings. The indicator scale is graduated in thousandths and ten-thousandths of an inch. The graduations are sufficiently far apart to permit variations of 0.00005 inch in diameter to be detected. The anvils of this gage are hardened, ground, and lapped. Anvils tipped with diamonds or tungsten carbide can be furnished if desired.

BURGESS BEARING TESTER

An equipment designed for inspecting ball and roller bearings electrically has recently been developed by the C. F. Burgess Laboratories, Inc., and is being introduced on the market by the Burgess-Parr Co., Room 1806, 111 W. Monroe St., Chicago, Ill. It is claimed that

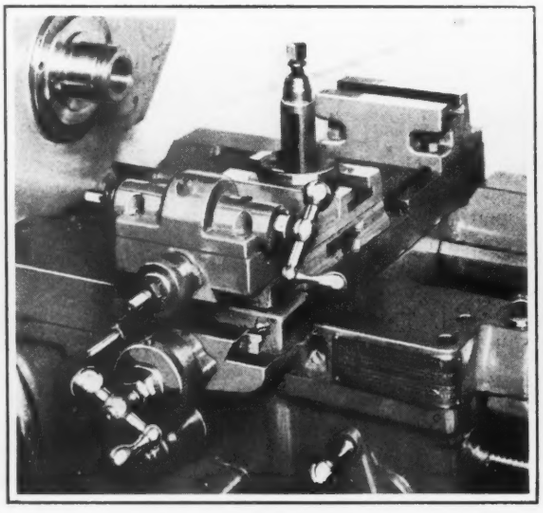


Fig. 1. Front and Rear Tool-block Construction with Right-angle Adjustment for Cross-feed Screw

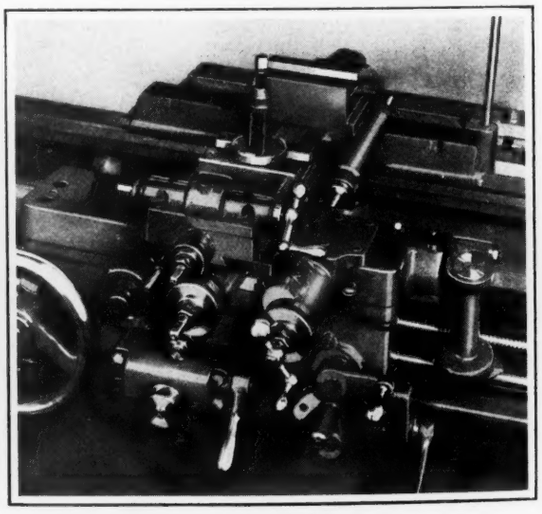
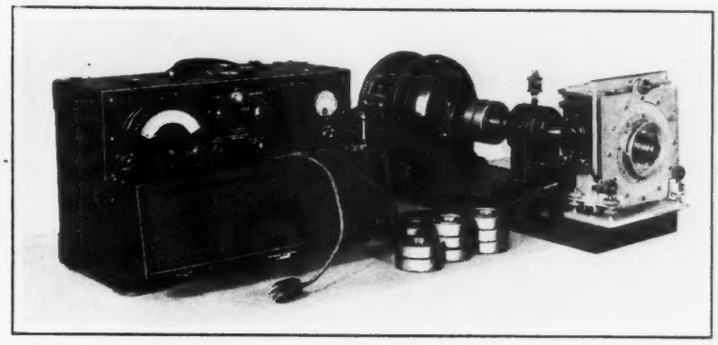


Fig. 2. Arrangement in which the Rear Tool-block is Equipped with a Separate Adjusting Screw

bearings can be sorted more definitely and accurately by the use of this instrument than by listening to them.

The tester is one of a group of acoustometers which detect the amount of undesirable vibration in bearings. The vibrations are transformed into electrical impulses which, when amplified, deflect the needle of an electrical meter. The extent of the deflection indicates the amount of undesirable vibration in the bearing under test. By means of electrical filters, only those vibrations that are indicative of bearing quality are amplified.

The equipment can be used in a noisy room as well as in a sound-proof one. It is provided with adapters for testing bearings from 2 to 6 inches in diameter, but special adapters can be furnished.



Electrical Equipment for Inspecting Ball and Roller Bearings

WELLS REAMER SHARPENER

Straight or tapered reamers with flutes up to 4 inches long, an over-all length up to 12 1/2 inches, and a diameter up to 2 1/2 inches can be sharpened in a bench type machine which has been placed on the market by the Wells Mfg. Co., P. O. Box 613, Greenfield, Mass. Reamers with either straight or spiral flutes can be handled. This equipment is intended particularly for use in repair shops.

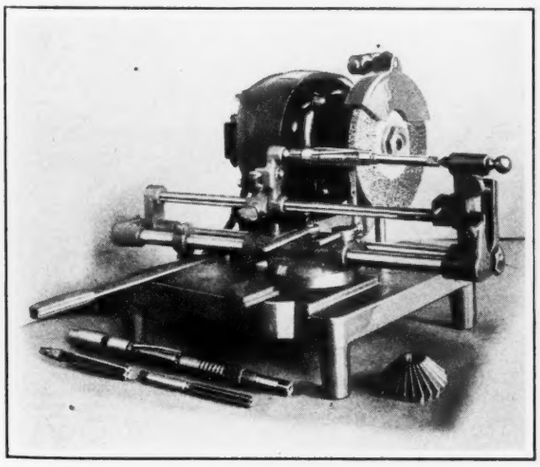
There is an attachment for grinding valve-seat reamers, which is easily clamped in position and adjusted for size and angle. A diamond dresser is furnished, as well as two tooth rests. The weight of this outfit is 65 pounds. It occupies a bench space of 14 by 21 inches.

REEVES ELECTRIC AUTOMATIC AND REMOTE CONTROLS

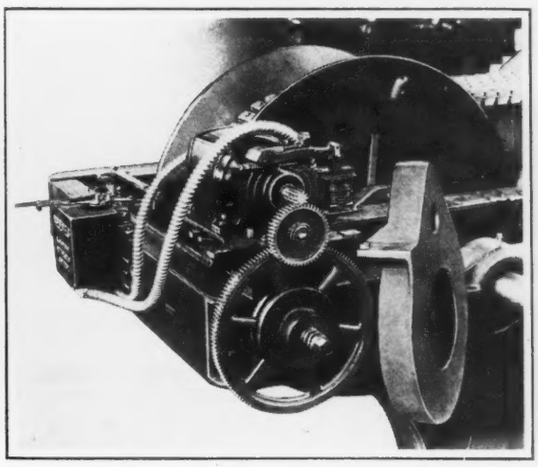
An electric automatic control and an electric remote control have been designed by the Reeves Pulley Co., Columbus, Ind., for use in certain applications of the variable-speed transmission made by the concern. The automatic control provides an infinite number of machine speeds between predetermined limits. It automatically changes the speed as often as necessary, in accordance with varying requirements of the machine or materials. All the speed changes can be effected without interfering with the operation of the machine.

The automatic control consists, as illustrated, of a fractional-horsepower reversible motor of either alternating or direct current; a train of reduction gears; a safety slip clutch; a solenoid brake; a two-way mercury switch; and a gear guard. The mercury switch provides for running the reversible motor either clockwise or counter-clockwise.

The electric remote control enables an operator, without leaving his position, to accurately change and regulate the speed of one or more machines by merely pressing a button. He



Wells Sharpening Machine, Applicable to Both Straight and Tapered Reamers



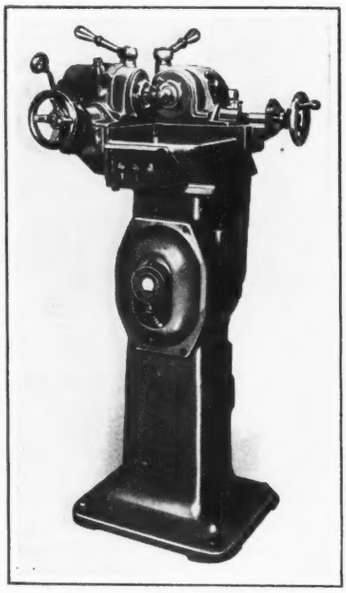
Electric Automatic Control for Reeves Variable-speed Transmission

has complete control of the machine or machines to suit varying speed requirements in the day's work. This control is identical with the electric automatic control in every detail except the switch. A push-button station is furnished, which has one button for operating the reversible pilot motor clockwise and another for operating it counterclockwise. These buttons are labeled "Fast" and "Slow."

GLEASON BEVEL-GEAR TESTING MACHINE

A 3-inch machine designed for testing the running qualities of straight and spiral bevel gears of the smaller sizes with shafts intersecting at 90 degrees has been brought out by the Gleason Works, 1000 University Ave., Rochester, N. Y. The gears are tested by running them together in pairs or in mesh with a reference gear. Tests may be conducted to check the set-up of the gear-cutting machine. The gears can also be tested, after hardening, for both tooth bearing and noise, and to find out if the heat-treatment has made changes that must be compensated for in the cutting. In the case of lapped gears, the machine is used as a final check.

Gears can be tested with or without a load. Loads can be applied manually by means of a brake operated on the driven spindle, or they can be set for a fixed amount. The drive or pinion spindle is power-driven, and is operated in either direction by a push-button control. The pinion head is adjustable horizontally.



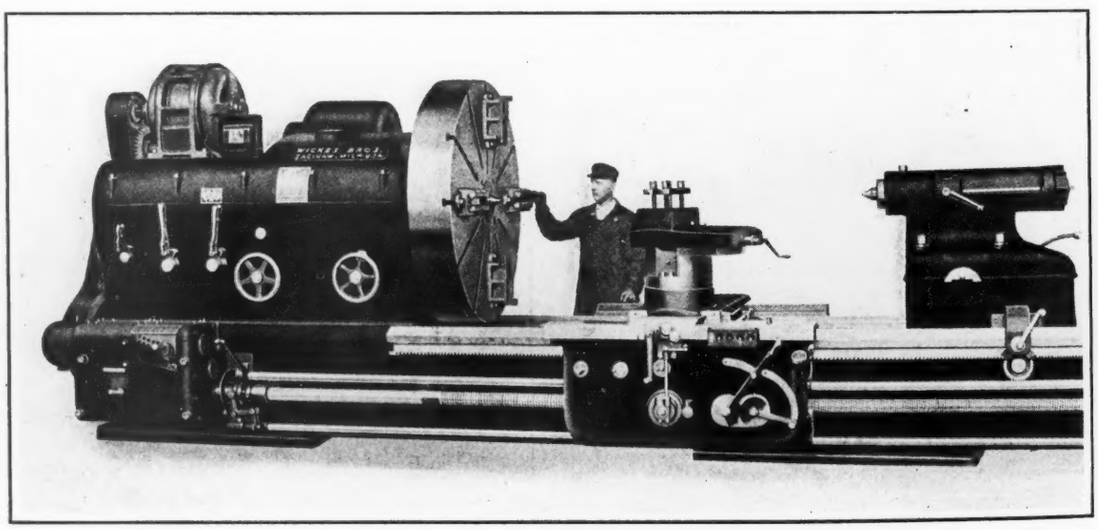
Gleason 3-inch Bevel-gear Testing Machine

The driven or gear spindle is mounted in an eccentric which permits a slight height adjustment, either above or below center, with reference to the axis of the drive spindle. This adjustment enables any desired location of tooth bearing to be obtained. Also, an estimate can be made of the change required in the settings of the cutting machine to produce the bearing in the correct mounting of the gears. The adjustment can also be used to compensate for wear in the ways of the machine. Both the gear and the pinion heads are clamped to the frame at front and rear by separate clamps, which operate with an equalized tension from a single lever.

The machine is arranged for a belted motor drive from a 1/2-horsepower motor.

WICKES 60-INCH HEAVY-DUTY ENGINE LATHE

A 60-inch heavy-duty geared-head engine lathe with a triple-geared faceplate drive has been added to the line of equipment built by Wickes Bros., Saginaw, Mich. The general construction of this machine, as can be seen in the illustration, follows that of the lathes described in February, 1929, MACHINERY, page 467. As in the case of the previous lathes, the new machine is equipped throughout with ball and roller bearings, except for the main spindle bearings which are bronze boxes. The headstock is filled with oil to a certain level, and the supply may be ob-



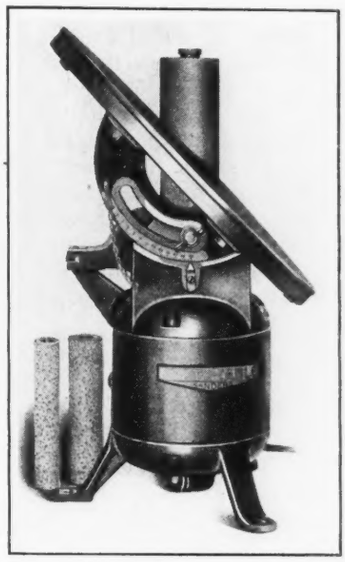
Wickes 60-inch Heavy-duty Engine Lathe with Triple-gear Faceplate Drive

served through a glass gage. Lubricant is delivered by a geared pump through piping to each bearing.

Levers on the front of the headstock provide for selecting any of sixteen spindle speeds. The range of speeds obtained through the faceplate drive is from 2 to 50 revolutions per minute, while the speeds available through the direct spindle drive are from 8 to 200 revolutions per minute. The handwheel at the extreme right of the headstock is used for engaging or disengaging the faceplate drive, and the lever at the extreme left of the headstock for reversing the lead-screw.

The quick-change gear-box at the front of the lathe furnishes forty feeds, the longitudinal feeds ranging from 0.025 to 0.700 inch per spindle revolution, and the cross-feeds from 0.009 to 0.252 inch. Threads from 14 to 1/2 per inch can be cut.

Other important specifications of the machine are as follows: Actual swing over bed, 62 inches; swing over carriage slide and compound rest, 50 inches; length of standard bed, 20 feet; maximum distance between centers with standard bed length, 8 feet, and with tailstock overhung, 9 feet 1 inch; and net weight of machine with standard bed length, approximately 48,000 pounds.



Porter-Cable Oscillating-spindle Sander

PORTER-CABLE OSCILLATING-SPINDLE SANDER

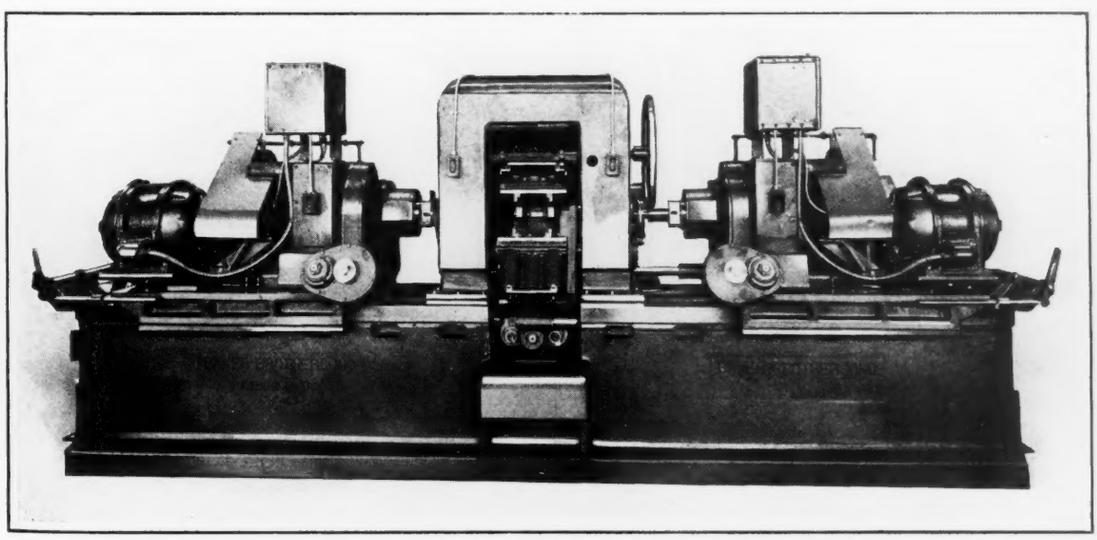
The bench model oscillating-spindle sander here illustrated has recently been redesigned by the Porter-Cable Machine Co., Salina and Wolf Sts., Syracuse, N. Y. This machine is intended primarily for intermittent service in sanding all kinds of curved, irregular and angular internal surfaces of wood or metal such, for example, as are encountered in the manufacture of furniture, patterns, fixtures, etc.

Several important changes have been made in the machine. For instance, the split-phase motor previously supplied has been replaced by a 1/4-horsepower specially built motor of the repulsion induction type. This motor can be operated on current of either 110 or 220 volts.

The table is supported by a segment which is graduated in degrees and allows the table to be tilted downward any amount up to 45 degrees. The spindle oscillates ninety times per minute, has a travel of 1/2 inch, and revolves at the same speed as the motor, which is 1725 revolutions per minute.

BAKER DUPLEX HYDRAULIC-FEED MACHINE

A large horizontal duplex machine of the construction illustrated has been added to the line of hydraulic-feed equipment built by Baker Bros., Inc., Toledo, Ohio. The two heads of this machine can be made special with single or multiple spindles and can be designed for tapping operations. The particular machine shown has a two-spindle head at each end for boring and



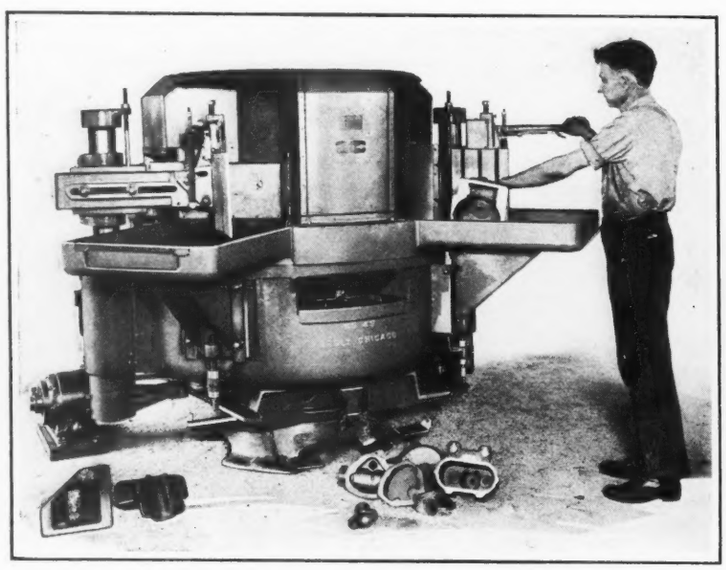
Baker Duplex Hydraulic-feed Machine Equipped for Boring and Tapping Valve Bodies

tapping valve bodies, either cast-iron or steel, having tapped holes from 1 1/4 to 4 inches.

The work is mounted in a three-station indexing fixture which revolves on a horizontal axis. This fixture is provided with an attachment that automatically brushes the chips to the rear and out of the machine. Adapters are furnished in the fixture plate to suit each different size of fitting handled, and the head spindles are adjustable for setting the tools in the required position.

The main frame of the machine is a single casting on which the two heads are mounted. These heads are provided with independent 15-horsepower motors which transmit power through multiple V-belt drives. To obtain the desired tapping lead from the hydraulic feed mechanism, the heads are fed against separate retarding cams. These cams are made in two pieces so that different tapping leads can be secured quickly. Approximately ten minutes is required to make such changes. Separate geared pumps are supplied for each head, with direct-connected three-horsepower motors. There are separate oil reservoirs for these pumps.

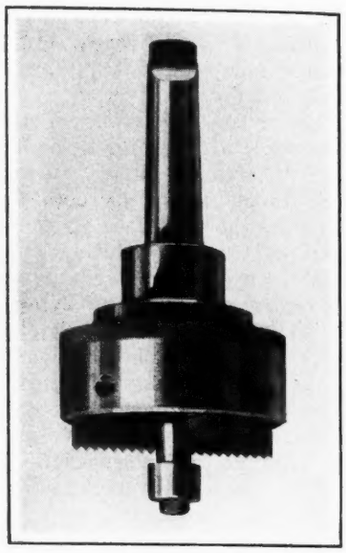
The operation of the machine is entirely automatic. After the operator presses a push-button to start the main drives, the heads feed the tools through the work, the taps collapse, the heads back out, and the motors stop to await the next cycle. The machine can be furnished for a wide range of operations by merely changing the heads and fixture. The weight of the machine illustrated, complete with the fixture, is approximately 20 tons.



Besly Production Grinder for Work Finished to Dimensions or with Faces at Right Angles to Each Other

MUMMERT-DIXON COMPOUND SPOT-FACING TOOL

Retracting roughing cutters and fixed finishing cutters are embodied in a compound spot-facing tool recently developed by the Mummert-Dixon Co., Hanover, Pa. This tool is designed to face small bosses quickly and accurately. The roughing cutters have serrated or sawtooth cutting edges, as illustrated, which break up the hard rough scale on cast iron or steel and cut down the bosses rapidly to the approximate size. The roughing cutters are movable in the head, so that their cutting faces can be set ahead of the finishing cutters to enable the rough cutting to be done before the finishing cutters touch the work. When the roughing is completed, these cutters are drawn back, leaving the finishing cutters projecting.



Spot-facing Tool with Retracting Roughing Cutters

The withdrawal of the roughing cutters is accomplished without stopping the machine spindle by simply grasping the knurled adjusting ring with the hand. These cutters are quickly returned to their working position by turning the adjusting ring in the opposite direction.

At the center of the head there is a pilot stem on which thimbles of any size may be mounted to fit any size of hole in the boss to be faced. An auxiliary pilot post can be used when the hole in the boss is rough-cored or is too large for the regular pilot. This auxiliary post may be fastened to the table of the machine and extended up through the boss hole to steady the spot-facing tool. This tool is made in four outside cutting diameters of 2 1/2, 4, 5, and 6 inches.

BESLY WET GRINDER

A No. 49, 53-inch, two-station wet grinder has recently been built by Charles H. Besly & Co., 120-B N. Clinton St., Chicago, Ill. This machine, as shown in the illustration, is equipped with a 40-horsepower direct motor drive, with geared-lever power-oscillated tables, and with a spe-

cial spring feed and lockout. It is a production machine intended for grinding work to specified dimensions and also parts having faces at right angles to each other.

Water is delivered at a high pressure to the grinding disk for removing the grindings and keeping the disk cool and free cutting. Hoods and baffles confine the water and keep the operator dry. The grinding members are "Titan Steelbacs," 1 inch thick, bonded with Bakelite. Production on the work shown runs as high as 125 pieces per hour.

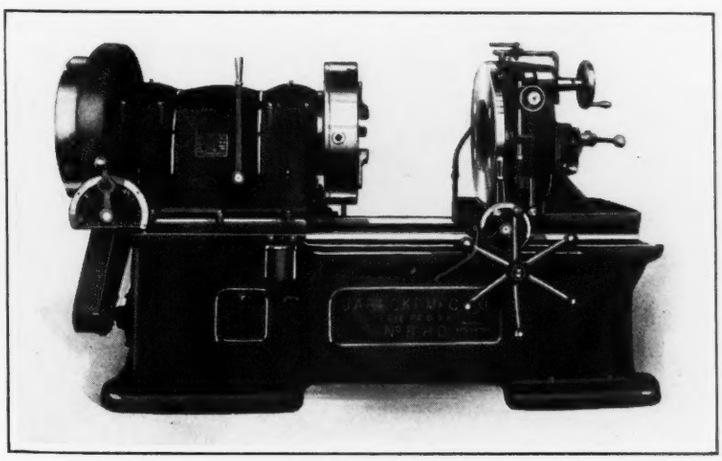
JARECKI HIGH-SPEED PIPE THREADER

High speed of operation, an automatic self-opening die-head, and the use of Timken tapered roller bearings throughout the construction are the principal features of the improved No. 8-HD pipe threader brought out by the Jarecki Mfg. Co., Erie, Pa. Six spindle speeds give the 8-inch machine an average threading speed of over 29 feet per minute. Eight-inch pipe is cut off at the rate of over 100 feet per minute.

The automatic self-opening die-head covers the entire range of the machine, so that it is never necessary to change die-heads. This die-head not only covers the standard range of from 2 1/2- to 8-inch pipe, but also an extra range of from 1 1/2- to 2-inch pipe. Two sets of chasers, six in each set, are furnished regularly. Both sets cut the entire standard range. It is only necessary to change the chasers for changes in thread pitch.

Accurate duplication of threads is insured by a steel trigger which extends inside the die-head and opens the dies automatically when the correct length of thread has been cut. This trigger can be set quickly for any desired length of thread by means of a dial on the die-head. The trigger recedes completely out of the way when the chasers are opened, returning again into position when the chasers are closed. A gear-driven reversible pump supplies oil to the die at the rate of 16 quarts per minute.

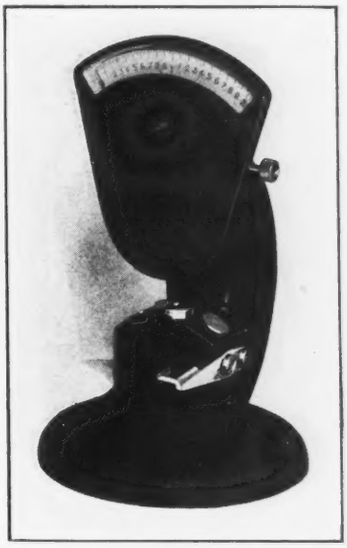
At the left-hand end of the headstock there is a speed-change dial with various pipe sizes marked on it. This enables the operator to select instantly the speed that will give maximum production for the particular size of pipe handled. This threader is built in 4-, 6-, and 8-inch sizes, and will also be made in a 12-inch size.



Jarecki High-speed Pipe Threader with Die-head that Covers the Complete Machine Range

AMES DIAL GAGE FOR THIN MATERIALS

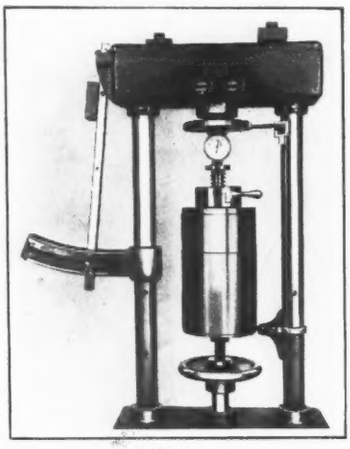
A gage equipped with a dial that reads direct to 0.000025 inch (closer measurements can be estimated) has been devised by the B. C. Ames Co., Waltham, Mass., for measuring thin material rapidly and accurately. Contact points of any size can be furnished. The jaws are opened by depressing the lower contact through a lever. Releasing this lever brings the lower contact up to a predetermined stop to give a zero dial reading on material less than 0.002 inch thick. On material of greater thickness, the zero reading is obtained by inserting a standard between the contact points and then allowing the lower contact point to come against the stop, which has been adjusted to bring the dial hand to zero.



Ames Dial Gage Graduated to 0.000025 Inch

"ELASTICOMETER" SPRING TESTING GAGE

When closely wound compression springs designed to carry a load of, say, one pound for each 0.001 inch of compression are being tested in the Type D "Elasticometer" spring testing machine sold by the Coats Machine Tool Co., Inc., 110-112 W. 40th St., New York City, the length scale is inadequate for taking accurate readings, being graduated in sixteenths of an inch. For such tests, the concern is now placing on the market the dial micrometer and spring loading fixture which is here illus-



"Elasticometer" Spring Testing Gage

trated in the working position. The dial micrometer is graduated to 0.001 inch and has a spindle travel of 1.000 inch.

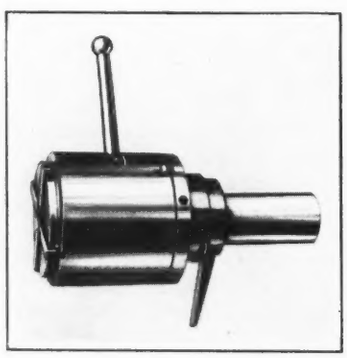
The lower loading fixture has a dovetailed slide. Mounted on this slide, there is a boss with a small projection, the total length of the boss and the projection being equal to the compressed length of the spring to be tested. As different bosses are required for each closed spring length, the bosses are detachable.

In a test, the first step is to determine the position of the dial gage hand when the dial gage spindle is flush with the plate through which it projects. In the example illustrated, this reading is 0.953 inch. Then the spring is slipped over the boss and the handwheel is turned to raise the lower compression plate until the dial reading is again 0.953 inch. Beyond this point, the projection on the boss previously referred to would enter a hole in the dial gage holder, but in this precise position, the compressed length of the spring must equal, within 0.001 inch, the length of the boss and its projection. The pendulum of the machine automatically indicates the load.

GEOMETRIC SELF-OPENING DIE-HEADS

A line of self-opening die-heads known as the Style KL has recently been placed on the market by the Geometric Tool Co., New Haven, Conn. Equipped with a lever or outside trip, these die-heads are particularly adapted for cutting short threads or threads of fine pitch. All stress in tripping is removed from the chasers and from the threads being cut, so as to prevent tearing the threads.

The trip-lever is placed so that it comes in contact with an adjustable stop which may be easily set up on any machine. Contact between the stop and the trip-lever causes the head to open when the desired length of thread has been cut. The head can be conveniently reset by means of the handle shown.



Geometric Die-head for Short or Fine-pitch Threads

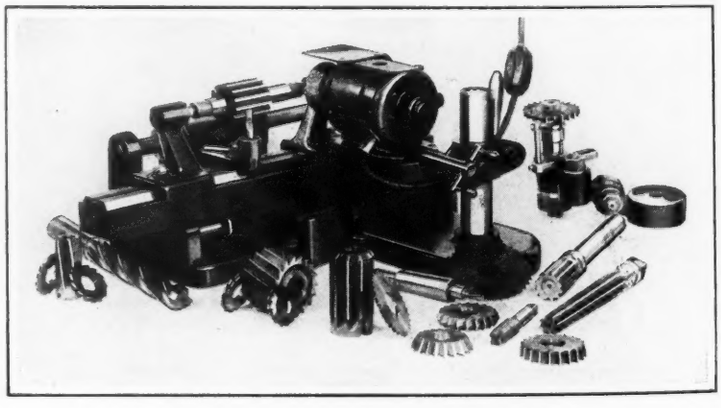
As in the case of all other tools in the K line manufactured by this concern, the chasers interchange, tool size for tool size, with those of other Style K die-heads. The KL die-heads are made in eight sizes for cutting threads from 1/8 to 5 inches in diameter and from 2 3/4 to 6 1/4 inches in length, with a solid shank. From 1/8- to 4 1/2-inch standard pipe threads can be cut.

"FLEX-ARC" WELDING ELECTRODES

General-purpose steel welding electrodes known by the trade name of "Flex-Arc" are being introduced to the trade by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. One of the principal advantages claimed is reduced metal spattering, so that a quiet, stable, and flexible arc is insured at both extreme low and high current values. Easy arc manipulation gives the operator a flexible tool for vertical and overhead welding. The electrodes are carried in six sizes ranging from 1/16 to 1/4 inch, inclusive.

UNIVERSAL CUTTER GRINDER

Practically all types of tools can be sharpened in a universal cutter grinder which is being placed on the market by the Surfacer Mfg. Co., 2442 Irving Park Blvd., Chicago, Ill. Cutters up to 6 1/4 inches in diameter can be ground between centers with the regular equipment; and by using special attachments, metal saws over 4 feet in diameter have been sharpened. The centers are adjustable from 0 to 14 1/2 inches apart. The table travel is large enough for all



Grinder Designed for Sharpening a Large Variety of Cutters

kinds of cutter grinding. One of the features of the machine is the ease with which it can be set up.

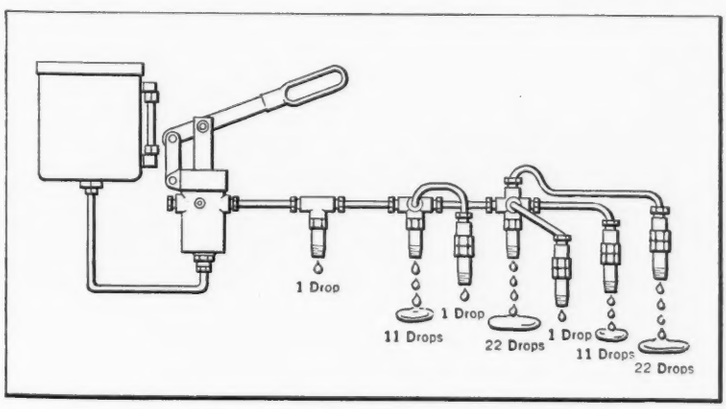
This grinder was designed primarily to provide tool-crib attendants with an inexpensive equipment for sharpening cutters during their spare time. The motor is of the universal type, operating on either direct or alternating current of 110 volts.

BOWEN POSITIVE LUBRICATION SYSTEM

In the article describing the Type B positive lubrication system recently produced by the Bowen Products Corporation, Auburn, N. Y., which appeared in August MACHINERY, page 997, the diagram illustrated the Bowen header type system rather than the "Oil Shot" piston type system. The accompanying illustration shows the Type B "Oil Shot" system.

Readers of the previous article will recollect that the Type B system comprises an oil reservoir, a hand-operated pump, and oil measuring devices which are assembled either at the points lubricated or in a manifold. The various units of the system are connected by tubing to one another and to the points lubricated.

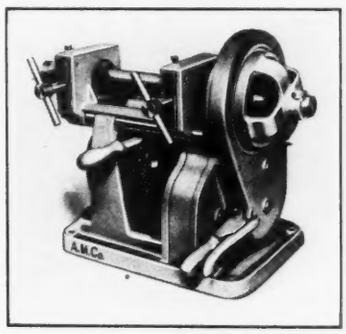
A single operation of the pump lever forces oil under pressure through the tubing of the distribution system to the oil measuring devices. These devices accurately measure and deliver predetermined amounts of lubricant under high pressure to the individual points to be lubricated. Any grade of oil from light machine oil to the heaviest oils that can be pumped can be handled without adjustments. In normal operation, the pump delivers oil under a pressure of about 500 pounds per square inch.



Bowen Type B "Oil Shot" Lubrication System

AXELSON PIPE THREADING MACHINE

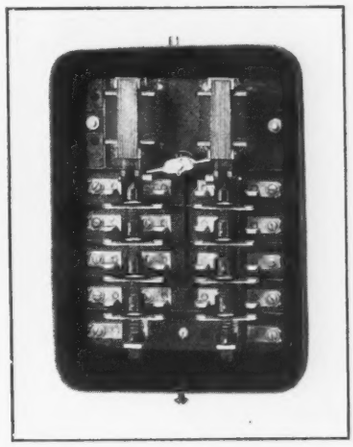
Pipe ranging from 1/2 to 2 inches in size can be threaded on a machine brought out by the Axelson Mfg. Co., Ltd., Los Angeles, Calif. In operation, the pipe remains stationary,



Axelson Pipe Threader which Holds the Pipe Stationary

while the standard square die is revolved to cut the thread. With this design, long assembled pipe or bent pipe can be threaded conveniently.

The work is gripped by two chucks which are practically automatic and instantaneous in action. Power is supplied by a 1/2-horsepower motor. In cutting threads, the die revolves at the rate of 17 revolutions per minute. After the thread is completed, the die runs in the reverse direction at a speed of 34 revolutions per minute.



General Electric Magnetic Reversing Switch for Small Motors

GENERAL ELECTRIC REVERSING SWITCH

Reversing equipment for squirrel-cage motors of 1 1/2 horsepower at 110 volts and 2 horsepower at 220, 440, 550, and 600 volts, 25 to 60 cycles, is shown in the illustration above. This is a recent product of the General Electric Co., Schenectady, N. Y. It consists of two contactors which are mechanically interlocked and have four sets of contacts and terminals. Three of the contact sets are for power circuits, and the other one is for the holding circuit of the coil. A forward, reverse, and stop push-button station is recommended by the manufacturer.

JONES & LAMSON TANGENT DIE

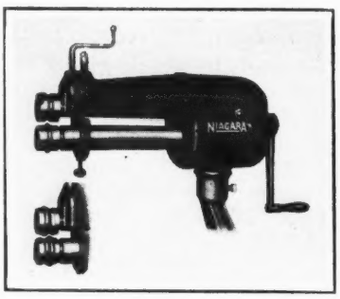
In a Model 21 threading die being placed on the market by the Jones & Lamson Machine Co., Springfield, Vt., the chasers are held tangent to the work rather than radially. One important advantage of this design is that a dull or worn part on the

ends of the chasers can be removed with a sacrifice of only a fraction of the chaser length. Furthermore, as the grinding is done on the ends of the chasers, machine adjustments for the length of thread are not required when the chasers are changed.

The chasers, one of which is shown at *A* in the illustration, have the thread profile ground at the proper helix angle for a given diameter and pitch. The dovetail on the back of each chaser is ground, and ratchet teeth are cut on the tongue of the dovetail to engage mating teeth in the chaser-holder. Each chaser-holder *B* has a ground dovetail that supports the chaser directly behind the cutting edge. Teeth on the end of a plug that fits the chaser-holder engage teeth on the back of the chaser to secure it against lateral movement. In sharpening the chasers, an amount equal to the pitch of the teeth on the back is removed from the end. The chasers are then measured in a gage *C*, a graduated micrometer screw indicating the location of the cutting edge when the chasers are assembled in the die.

The dovetail on each chaser-holder is ground to fit another ground dovetail in body *D*. When assembled, the chasers just clear the front face of the body and there is a minimum overhang. Radial movement of the chaser-holders is controlled by means of a cam ring *E* which is supported in four places by the lugs of the locking ring *F*. This locking ring is, in turn, supported by collar *G* and adjusting nut *H*.

A key on collar *G* locates and prevents rotation of operating sleeve *J*. Four cam surfaces on this sleeve engage mating surfaces on the locking ring. In operation, the backward movement of the operating sleeve causes the locking ring to rotate slightly, releasing the cam ring and opening the die. The forward movement of the sleeve closes the die.



Niagara Geared Hand-operated Beader

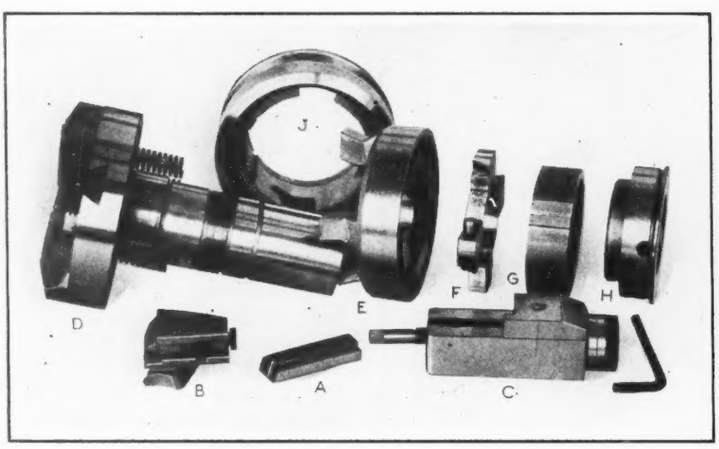
NIAGARA GEARED BEADING MACHINE

A hand-operated beader of a geared design, which reduces the effort required to operate it, has been added to the line of sheet-metal working equipment manufactured by the Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. With standard rolls, this beader has a capacity for handling material up to No. 18 gage. It has been designed primarily for the heavier beading operations encountered in the manufacture of blow-pipes, ventilators, stacks, etc., although it will work equally satisfactorily on lighter material.

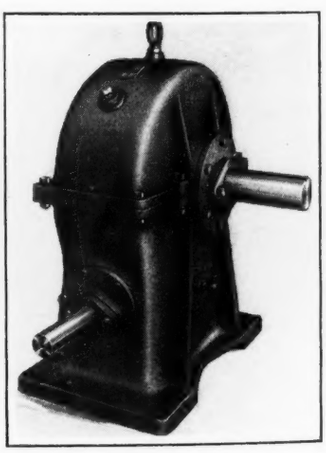
The throat is deep, so that beads can be rolled a considerable distance from the end of the material. The frame is of one piece, all gears and shafts being entirely enclosed. The steel horn that carries bronze bearings for the lower shaft also contains a large pocket that serves as an oil reservoir for lubricating that shaft. The upper shaft can be raised and lowered through a crank-screw. A gage with a polished face slides on the lower horn.

BOSTON HEAVY-DUTY SPEED REDUCER

The Type TF right-angle drive speed reducer here illustrated has been brought out by the Boston Gear Works Sales Co., North Quincy, Mass., primarily for heavy-duty applications. It is available from stock at the service stations of the concern. This equipment is similar in construction to other Type T reducers, consisting of a phosphor-bronze gear which operates in conjunction with a hardened steel worm having a ground thread. The shafts are mounted in Timken



Disassembled Parts of Jones & Lamson Tangent Die



Boston Heavy-duty Speed Reducer

tapered roller bearings. This reducer is available in sizes up to 20 horsepower and in ratios from 15 1/2 up to 80 to 1.

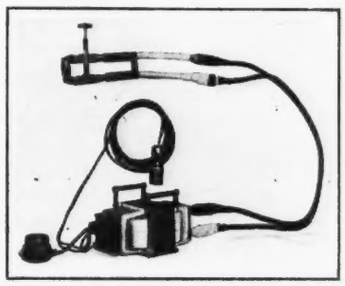
UEHLING POTENTIOMETER PYROMETER

A "Self-Contact" potentiometer pyrometer has recently been developed by the Uehling Instrument Co., 473 Getty Ave., Paterson, N. J. Either a thermocouple or an electric resistance bulb may be used as the temperature element. The recorder is actuated by a galvanometer that may be placed in any desired location apart from the recorder. One galvanometer will actuate as many as four recorders, each in a different location, measuring different temperatures, and, if desired, having entirely different calibrations.

GENERAL ELECTRIC BRAZING EQUIPMENT

In an electric brazing equipment recently brought out by the General Electric Co., Schenectady, N. Y., brazing is caused by the heat generated by the flow of electricity through carbon blocks. As these blocks offer high resistance to the flow of electricity, the heat generated is correspondingly high, and only a small pressure is needed to complete the joint. The equipment consists of a transformer, foot switch, and tongs for holding the carbon blocks and work.

The sizes of the various parts depend upon the dimensions of the work and the joints to be made. A typical equipment includes a transformer of 5 kilovolt-amperes, weighing 45 pounds and having 220-volt primary and 8-volt secondary taps. The illustration shows a 10 kilovolt-ampere transformer intended for heavier duty. It weighs 95 pounds, has the same primary tap as the 5 kilovolt-ampere transformer, and has 8-, 10- and 12-volt secondary taps.



Brazing Transformer with Voltage-change Tap

LINCOLN GASOLINE-ENGINE-DRIVEN WELDER

A gasoline-engine-driven welder designed to use the larger sized electrodes has recently been placed on the market by the Lincoln Electric Co., Coit Road and Kirby Ave., Cleveland, Ohio. This equipment, as here illustrated, is rated at 400 amperes with a current range up to 500 amperes, and is of the variable-voltage single-operator type. It is intended for field work.

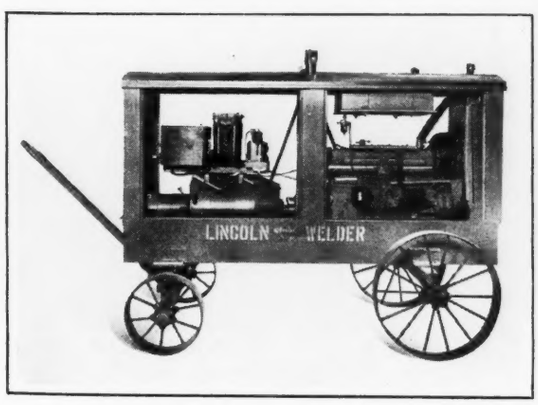
The working mechanism of all controls is contained in a ventilated enclosed steel cabinet which is mounted directly over the generator for easy access. The gasoline engine has six cylinders and is equipped with an automatic throttle control which permits it to idle at about half speed when the arc is not going. When the arc is struck, the engine immediately comes up to full speed. The over-all dimensions, exclusive of the wheels, are 104 by 32 by 58 inches. The weight is approximately 3500 pounds.

CRESCENT POWER LIFT TRUCK

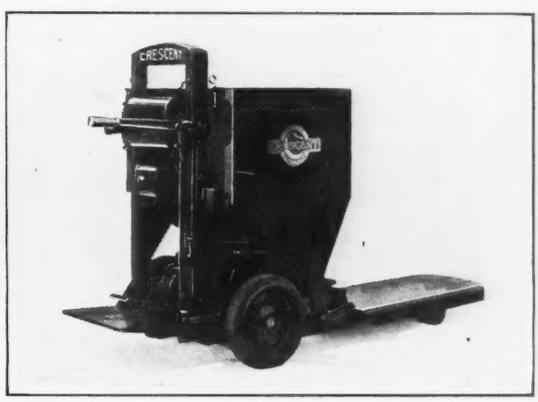
An electric lift truck recently developed by the Crescent Truck Co., Lebanon, Pa., for use with hand-truck platform skids 7 inches or over in height, is shown in the accompanying illustration. This truck was designed to fill the place between the larger and heavier industrial trucks and the ordinary hand lift truck.

The general specifications are as follows: Capacity, 3500 pounds; over-all length, 88 inches; over-all width, 33 inches; turning radius, 7 feet; and dimensions of lifting platform, 40 by 20 inches.

The truck operates at two forward speeds and two reverse speeds. A brake foot pedal interlocks with the control mechanism. Fafnir ball bearings and Timken tapered roller bearings are used throughout.



Lincoln 400-ampere Welder with Gasoline-engine Drive



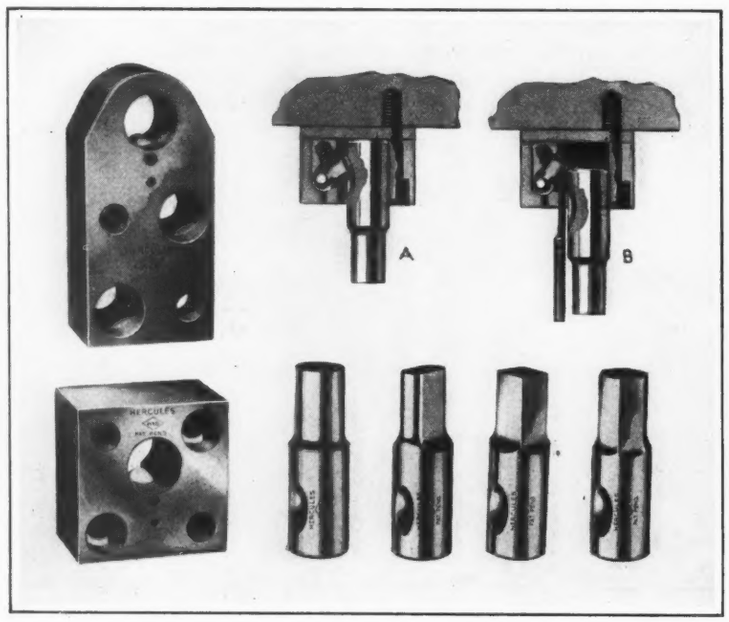
Crescent Power Lift Truck of 3500 Pounds Capacity

"HERCULES" INTERCHANGEABLE PUNCHES AND RETAINERS

Interchangeable punches and retainers have recently been brought out by Whitman & Barnes, Inc., Detroit, Mich., which are designed to eliminate the necessity of removing dies from presses when punches have to be changed. As will be seen at *A* in the illustration, each removable punch is held in a retainer by a detent which acts in a recess in the punch shank. The punch is instantly released when the detent is pushed upward out of the way by employing an extractor pin *B*, which extends through a hole in the retainer block.

The detent supports the punch and eliminates all possible longitudinal movement, keeping the punch in contact with the backing plate at all times. In the operating position, the detent transmits the stripping strain from the punch to the retainer in a line at approximately 60 degrees with the axis of the punch. The result is that for every 100 pounds of stripping strain introduced when the punch is removed from the metal, only 200 pounds of transverse strain is transmitted to the retainer through the detent.

The retainers are made in square and rectangular types, as shown at the left in the illustration, to take punches of the sizes most commonly used in standard practice. When it is impossible to use standard retainers together or in combinations, because of the center distances required, a special group plate or retainer can be supplied with center distances to meet specifications. The retainers can be mounted on standard die sets and the punches aligned with regular die buttons. The punches are made and stocked in commonly used sizes and with round, oblong, square, and hexagonal piercing points, as shown at the bottom of the illustration.



"Hercules" System of Interchangeable Punches and Retainers

CUTLER-HAMMER THREE-POSITION PILOT SWITCH

Motor-driven pumps, compressors, and similar machines controlled by an automatic pilot device such as a float switch, pressure switch, time clock, etc., often require some means of starting and stopping the motor manually. For this purpose, Cutler-Hammer, Inc., 1203 St. Paul Ave., Milwaukee, Wis., has developed the three-position pilot switch here illustrated.

Cutler-Hammer Pilot Switch with Three Positions

The operating lever of this switch can be placed in either the "automatic," "off," or "manual" positions. Automatic operation is obtained when the lever is turned to "automatic." With the lever in the "off" position, the motor cannot be started from any other control point. Turning the lever to the "manual" position makes the motor run continuously, regardless of other control devices, as long as there is operating voltage on the line.

TAYLOR-WINFIELD PIPE WELDER

Steel pipe used for carrying gas or gasoline from fields to distribution centers can be welded into double lengths in a machine recently developed by the Taylor-Winfield Corporation, Warren, Ohio. This practice reduces by 50 per cent the number of welds that would otherwise have to be made in the field. To make these double-length sections, which are approximately 48 feet long, resistance flash welding has been adopted. One size of this machine is shown in the accompanying illustration.

Air, hydraulic, and voltage controls of the machine are located convenient to the operator's position on top of the welder. From this position, the

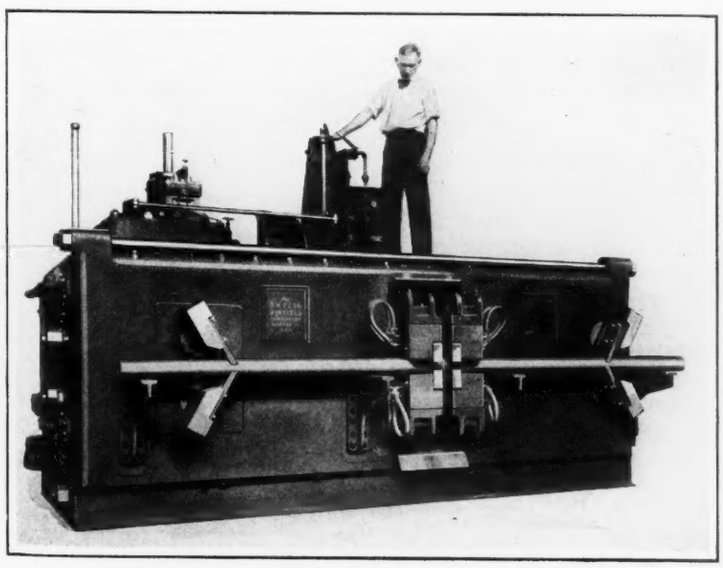
operator has a complete view of the work and does not interfere with the movements of the pipe.

Clamping of the current-carrying jaws is accomplished by means of air cylinders which operate through toggles. The jaws are of an equalizing type and accurately center both pipe sections to be welded, regardless of size variations. The back-up shoes which hold the pipe are provided with suitable teeth.

The transformer is located close to the clamping jaws so as to insure high efficiency. The primary coils are entirely enclosed to protect them from flash and from particles of steel that might cause "burnouts." Owing to the wide range of pipe that can be held and welded, provision had to be made for a wide range of welding voltages. A new type of multi-coil transformer with a selective switch gives twelve voltages. The machine shown in the illustration handles pipe from 2 to 10 inches.

Hydraulic pressure is employed for operating the push-up and for obtaining automatic flashing. The hydraulic equipment is motor-driven and comprises a constant-pressure variable pump. The welding cycle is controlled by means of a dial valve, and can be varied in speed from 4 to 40 seconds as required for different pipe sizes. The adjustment is infinitely variable, and not by steps. While the flashing and push-up occur automatically, they can be stopped or reversed at the will of the operator and a complete cycle started again.

Equipment of this type can be furnished in four sizes for pipe from 1 1/2 to 6, 2 to 10, 6 to 16, and 14 to 24 inches.



Taylor-Winfield Machine for Welding Pipe into Double Lengths

EIGHT-SPEED FLEXIBLE-SHAFT MACHINES

A patented V-disk speed-changer which provides eight different speeds ranging from 1000 to 11,000 revolutions per minute can now be attached to any standard flexible-shaft machine made by the United States Electrical Tool Co., 2477 W. Sixth St., Cincinnati, Ohio. The accompanying illustration shows a flexible shaft equipment provided with this speed-changer. Changes are accomplished instantly. It is claimed that because the device provides the proper speed for any particular tool or job, the life of rotary files and grinding wheels is lengthened.

The shaft and casing of the flexible shafts have also been improved to make them more flexible. The casing expands and contracts to absorb stresses heretofore thrown on the shaft or core. Stresses are further relieved by a slide coupling at the motor end of the casing. The shaft is fastened rigidly to the motor, carries ample lubrication, and is provided with a coil bearing between it and the casing. The hand-piece turns on ball bearings in a grease-tight compartment.

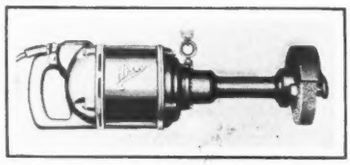
Flexible-shaft Equipment with V-disk Speed-changer

Flexible shaft equipment is made by this concern in sizes of from 1/4 to 3 horsepower and in various styles of mountings, including overhead or vertical, trolley, floor, and bench. Three classes are made, including engravers', die-sinkers' and heavy-duty models.

HISEY HEAVY-DUTY PORTABLE GRINDERS

Hand grinders made in one- and two-horsepower capacities for both direct and alternating current have been added to the line of portable electric tools made by the Hisey-Wolf Machine Co., Cincinnati, Ohio. The single-phase, alternating-current grinders for operation from lamp sockets are equipped with improved commutating-type repulsion-induction motors. They are designed to start and pick up speed instantly under any load within twice their rated capacity.

Two- and three-phase grinders for connection with power



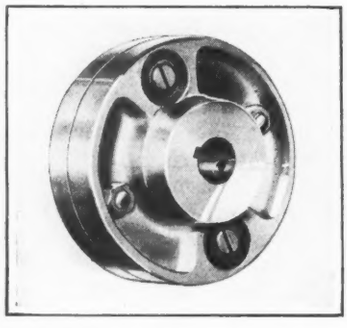
Hisey Grinder Made in One- and Two-horsepower Sizes

circuit lines can be furnished special for any current from 80 to 275 volts and in 25, 40, or 50 cycles.

The use of a one-horsepower grinder in conjunction with one of two-horsepower rating is recommended by the manufacturer. In such practice, when the original 10-inch diameter grinding wheel is worn to 8 inches, it can be transferred to the one-horsepower grinder for operating at a high speed and thereby maintaining the original efficiency. The weight of the one-horsepower grinder, equipped with a steel guard, is 90 pounds, and of the two-horsepower grinder, 127 pounds.

AJAX FLEXIBLE COUPLING

The Ajax Flexible Coupling Co., Westfield, N. Y., has recently placed on the market a Type E coupling which is of the pin and rubber bushing design and is a modification of the standard Type A coupling manufactured by this concern. The new product is a special coupling of limited size designed for certain applications in connection with centrifugal pumps, small speed reducers, motor-generator sets, fans, etc.

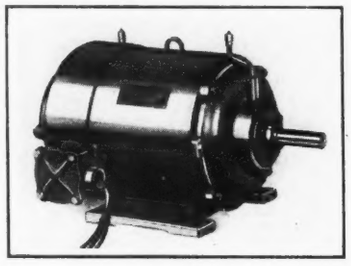


Ajax Flexible Coupling with Aluminum Flanges

It is made with aluminum alloy flanges, hardened and ground alloy-steel drive studs, and compounded rubber bushings which are cemented to bronze bearings. This coupling has an outside diameter of 4 inches, measures 2 1/16 inches long over-all, and has a weight of only 2 pounds. It has a rating of 7 1/2 horsepower at a speed of 1750 revolutions per minute on steady loads. The coupling is easy to assemble, and provides free end-float.

LOUIS ALLIS TOTALLY ENCLOSED FAN-COOLED MOTORS

Totally enclosed, fan-cooled squirrel-cage motors of a new type are being introduced to the trade by the Louis Allis Co., Milwaukee, Wis., in capacities ranging from 3 to 100 horsepower. As these Type J motors



Louis Allis Enclosed Motor which can be Easily Reassembled

are sealed to exclude all foreign elements, they are suitable for use in atmospheres containing abrasive dust, corrosive fumes, oil, moisture, etc.

The new motors follow the design of the Type R motors manufactured by the concern, the same methods of enclosing and ventilating being used. However, there are a number of improvements including cartridge-type bearing chambers and simple devices for quickly removing the fan, ventilating shell, and heads. Because of these improvements, the new motor can be dismantled and reassembled with ease. It is stated that the rotor can be changed end for end and the motor reassembled in less than five minutes.

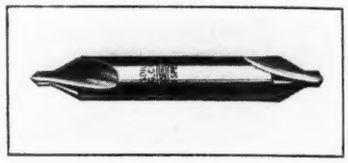


Fig. 1. Cogsdill "Free-cutting" Center Drill

COGSDILL "FREE-CUTTING" CENTER DRILLS

In manufacturing connecting-rods, a Detroit automobile builder drills center holes in the forgings for use as locating points in subsequent operations. The forgings are made from a very tough vanadium steel, and considerable trouble was experienced from the center drills breaking. To overcome this difficulty, the Cogsdill Mfg. Co., Detroit, Mich., by experimenting with various modifications in the forms of the flutes, web thickness, clearance, and rake, developed a new type of center drill known as the "Free-cutting Cogsdrill."

The new center drill has spiral flutes milled at a greater helix angle than in the previous type of tools made by the company. This increased angle makes it easier to take a progressive shearing cut with continuous chips. The physical effort of the operator, when feeding the drilling machine by hand, is also reduced materially. The flutes are milled with a form cutter that rounds the bottom and forms a smooth surface from which the chips can easily escape. The rake angle of the cutting edges has been substantially increased.

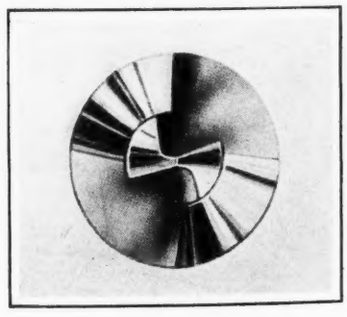


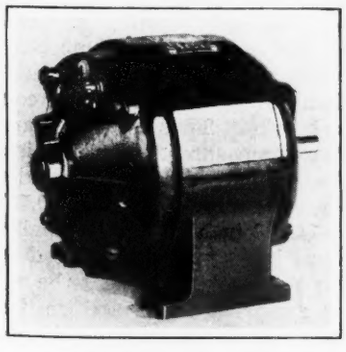
Fig. 2. End View of Drill, Showing Form of Flutes

The new drill has been tried out thoroughly under actual working conditions in a number of automobile plants. On the connecting-rod job to which reference has been made, the average number of holes with one of the former drills was 2250. This was increased to 3875 with the new tool. One manufacturer, working on automobile axle shafts, found it possible to increase production from 50 to 75 holes with the older type of drill to from 380 to 400 with the new drill. Because of these results, the Cogsdill Mfg. Co. now makes this tool as its standard center drill.

WESTINGHOUSE CLUTCH-TYPE MOTOR

A motor recently placed on the market by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., for driving small machines operating on 110-volt lighting circuits is equipped with a clutch mechanism. This motor is of 1/4 horsepower rating, runs at 1725 revolutions per minute, and has a high starting torque by virtue of the clutch.

Under normal conditions, the motor carries the load up to speed in the same manner as an ordinary split-phase motor. However, in cases where the load is heavy or difficult to start, the motor delivers a series of power impulses that tend to overcome friction and inertia and bring the load up to speed. These power impulses increase until the load is started.

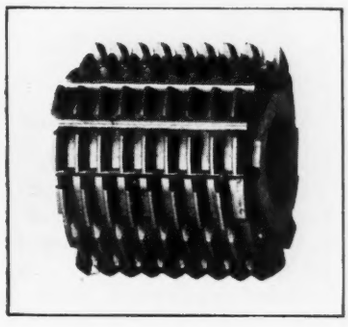


Small Westinghouse Motor with Clutch

Bunting "Copper Bronze" Hammer

BUNTING "COPPER BRONZE" HAMMER

A "copper bronze" machinist's hammer has been developed in the metallurgical research laboratories of the Bunting Brass & Bronze Co., Toledo, Ohio. This hammer is made of an alloy that combines safeness with durability. It is stocked in 1- and 2-pound sizes. Other sizes can be furnished. The hammer is fitted with a hickory handle which can be replaced if broken.



Barber-Colman Gear Hob with Wide Tooth Tips

BARBER-COLMAN GEAR HOB

In designing the "High Production" hob now being introduced on the market by the Barber-Colman Co., Rockford, Ill., investigation showed that the tips of hob teeth do the greater share of the work. Consequently the tips of the teeth on the new hob are strengthened by assuming, for the gear to be cut, a pitch diameter smaller than the actual pitch diameter. The profile of the hob teeth is laid out on the basis of this assumed diameter. This makes the pressure angle of the hob smaller than the pressure angle of the generated gear, gives wider tips to the hob teeth, and makes the hob teeth narrower at the base without disturbing the outline of the generated gear teeth.

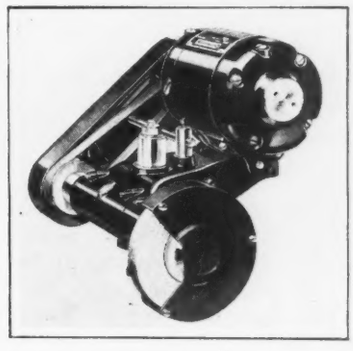
Another variation has been made from common practice to give a free cutting action. Ordinary hobs have equal side clearances on the teeth, but on the Barber-Colman hob the leading side has less clearance and the leaving side more clearance than customary.

With a view to increasing the smoothness of the cutting action still further, two more changes are made. First, straight gashes are used, producing teeth having faces at an angle with the line of the lead helix and thus giving a shearing effect on the leading edge and top of each tooth. Second, the teeth are sharpened with a considerable hook, instead of with a radial face.

DUMORE PORTABLE PRODUCTION GRINDER

A No. 7 portable grinder designed for quick application to lathes, shapers, milling machines, planers, and other machine tools is being introduced on the market by the Dumore Co., 25 Sixteenth St., Racine, Wis. This grinder is intended to meet both production and tool-room requirements. It is equipped with a 3/4-horsepower motor that operates on either alternating or direct current. The total weight is not over 45 pounds.

The motor and quill may be turned end for end. This feature permits grinding from either end of the equipment and allows the operator to mount the grinder on the back of a machine



Dumore Grinder for Application to Machine Tools

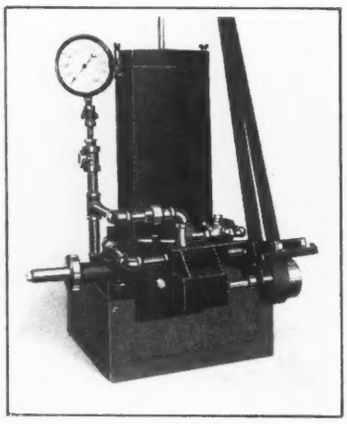


Fig. 1. Bornes Universal Compressor for Oil or Grease

if desired. An automatic take-up insures proper belt tension, eliminates belt slippage and prevents excessive pressure on the bearings.

The grinder is mounted on a special toolpost which permits radial and vertical adjustments of the tool. The toolpost can be mounted separately on machine tools and the grinder then placed in position. Other features of the grinder include a cooling system, an aluminum motor housing, bearings with an automatic take-up, and positive lubrication. There is a locking device on the frame for holding the grinder rigidly.

BORNES LUBRICATING EQUIPMENT

A universal compressor for delivering either oil or grease at required pressures to various bearing points of machinery is made by the Borne Scrymser Co., 17 Battery Place, New York City, for hand or power operation. Fig. 1 shows this compressor equipped with a belt drive. By removing the tight and loose pulleys, a motor can be direct-connected through a coupling. The compressor can be hand-operated from any of four positions by means of a pump handle attached to a booster piston.

The reservoir is integral with the compressor and is equipped with a rod that indicates the supply of lubricant. A hydraulic gage shows the pressure required to fill up the pipe lines and lubricators installed at the various points on the machine. This compressor is regularly made in 4- and 6-quart sizes, but larger sizes can be furnished.

The construction of the lubricators, which may be used in conjunction with the compressor or separately, is shown in Fig. 2. These lubricators function with oils of any viscosity and greases of most consistencies. They are fitted with an adjusting screw for increasing or decreasing the area of the orifice to permit the proper amount of lubricant to be delivered to the bearings. Graduations on the adjusting screw facilitate obtaining the same feed on all the lubricators of a machine.

ADJUSTABLE INTERNAL GAGE WITH CENTERING SUPPORT

In a "Mikrotast" internal gage now being introduced to the trade by the Coats Machine Tool Co., Inc., 110-112 W. 40th St., New York City, there is embodied a spring-operated yoke having two corner supporting points which insure a centralized position of the device at any point along the bore being inspected.

"Mikrotast" Self-centering Internal Gage

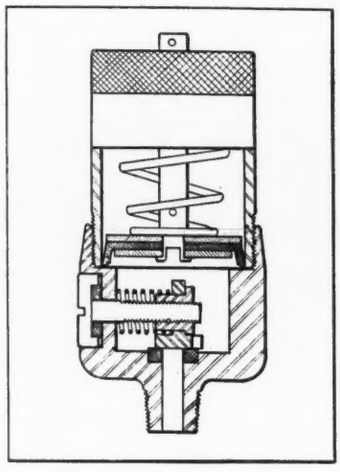


Fig. 2. Construction of Bornes Lubricator

The construction of this gage is shown in the illustration. It will be seen that the measuring contact point is located between the corner supporting points. An interchangeable extension leg, which is diametrically opposite the measuring contact point, may be adjusted to any desired diameter within the measuring range of the gage and then locked in position. The arrangement of the contact points differs from the usual star-shaped gage with its measuring contact point arranged opposite two fixed points of abutment.

This gage automatically locates itself properly in a bore, because the spring pressure exerted on the corner supporting points is considerably greater than that of the measuring contact point. Thus the full diameter is measured. Various sizes of gaging heads can be provided for measuring holes from 0.787 to 14.173 inches. In the smaller sizes, holes up to 2 inches deep can be inspected without the use of extension rods, and in the larger sizes, up to 5 1/2 inches deep. Extension rods are available for deeper holes.

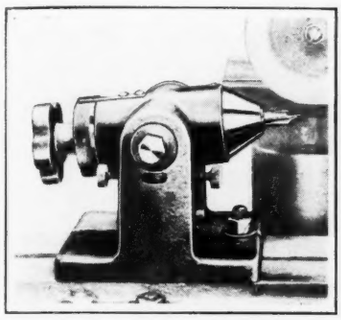


Fig. 1. Grinding the Flutes of Gear-tooth Chamfering Cutters

GRINDING ATTACHMENTS FOR GEAR-TOOTH CHAMFERING CUTTERS

Two grinding attachments have been brought out by the City Machine & Tool Works, 1517-31 E. Third St., Dayton, Ohio, for accurately grinding the cutters used on the Peerless gear-tooth chamfering machine built by this concern. Fig. 1 shows an attachment for grinding the cutter flutes, and Fig. 2 an attachment for grinding the relief.

In grinding the flutes, the cutter is held by a collet at the front of the attachment and is indexed to each successive flute by means of a ratchet and spring arrangement at the rear. In grinding the relief, the cutter is also held in a collet. A cam moves the collet back and forth in proper relationship to the grinding wheel to give the desired relief. At the same time, the cutter is revolved in synchronism with the in-and-out movement produced by the cam mechanism.

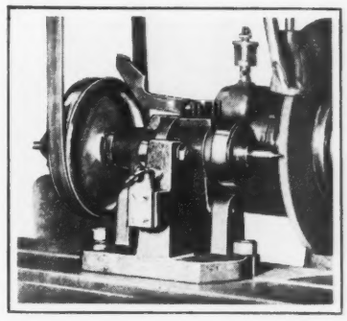


Fig. 2. Grinding the Relief on Gear-tooth Chamfering Cutters

In setting up a job in this attachment, the cutter is first placed loosely in the collet and then the overhead arm is swung over and lowered into a flute. The collet is then tightened on the cutter.

ANCHORS FOR BABBITT-BEARING LININGS

A new means of casting anchor holes for retaining babbitt linings in bearings has been developed by the Smith & Richardson Mfg. Co., Geneva, Ill. Conical recesses are formed in the face of the casting against which the babbitt linings are to rest by "anchors" of coated sheet steel attached to that part of the foundry mold that is to form the face of the bearing. The prongs of these cup-shaped anchors are pressed into the sand until the open end of the cup becomes slightly embedded in the sand. When the mold is poured, the metal of the casting surrounds the cup, leaving the open end exposed. The prongs, which project when the casting is taken from the sand, are removed in the cleaning operation, being scored so that they break off readily; the result is a clean under-cut hole in which the bearing metal will tighten up as it shrinks, anchoring the lining securely to the casting. These "babbitt anchors" are made in two sizes—3/8 by 1/8 inch deep and 1/2 by 3/16 inch deep. One anchor should be provided for each two square inches of bearing area, with a minimum of four to a half bearing.

THE WORLD'S SMALLEST SYNCHRONOUS MOTOR

The device shown in the accompanying illustration is believed to be the world's smallest synchronous motor. It is used in connection with delicate mechanisms where definite speeds are required, as in the case of relays. Note the size of the motor compared with a fountain pen. This motor was made by the Westinghouse Electric & Mfg. Co.

An Idea of the Size of This Motor will be Obtained by Comparing it with the Fountain Pen

POWER ENGINEERING EXPOSITION

The Ninth National Exposition of Power and Mechanical Engineering, to be held December 1 to 6 in the Grand Central Palace, New York City, promises to include a large number of interesting exhibits. Three months before the opening of the show, 400 exhibitors have contracted for space. In the first exhibition, eight years ago, there were only 105 exhibitors. It is not intended to hold the show in 1931, and this is probably an additional inducement for exhibitors to bring their new developments before the engineering fraternity at this time. I. E. Moultrop is in charge. He may be addressed at the National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York City.

PURCHASING MEN TO MEET IN PITTSBURGH

A meeting of the executive committee of the National Association of Purchasing Agents will be held in conjunction with the Sixth District Convention of the Association at Pittsburgh, October 16 and 17.

Repeat Orders

— a measure of successful performance

Who is better qualified to pass judgment on a product than the users of that product? Repeat orders have come from over 50% of the purchasers of the Brown & Sharpe "30 Series" Plain Grinding Machines. And, over 25% have installed three or more. Makers of a wide variety of products, in all parts of the industrial world, have thus substantially expressed their appreciation of the performance that these machines are rendering.

The «30 Series»

No. 30 12 x 18	No. 32 14 x 36
No. 33 14 x 48	No. 35 14 x 72

MODIFIED MACHINES

Nos. 30A, 32A, and 33A
(Power Table Feed for Wheel Truing, and Power Cross Feed)

Nos. 30B, 32B, and 33B
(Hand Table and Cross Feeds)

If you grind work within the capacity of these machines, it will be to your advantage to talk with our representative. A booklet describing the "30 Series" will be sent on request.
Brown & Sharpe Mfg. Co., Providence, R. I. U.S.A.

BROWN & SHARPE

An installation in a large eastern plant

A battery of eight machines in a mid-western factory

B·S

PLAIN GRINDING MACHINES

Nos. 30, 32, 33 and 35

NEWS OF THE INDUSTRY

CUTLER-HAMMER, INC., 1203 St. Paul Ave., Milwaukee, Wis., has recently acquired the Reynolite Division of the Reynolds Spring Co., Jackson, Mich.

RELIANCE ELECTRIC & ENGINEERING CO., 1042 Ivanhoe Road, Cleveland, Ohio, manufacturer of alternating- and direct-current motors, has moved its Boston office from 80 Federal St. to 89 Broad St.

SELAS CO., manufacturer of industrial gas heating equipment, has recently moved into a new plant at 18th St. and Indiana Ave., Philadelphia, Pa. The company is carrying out an extensive expansion program.

GREAT LAKES CHEMICAL WORKS, 5440 W. Jefferson Ave., Detroit, Mich., announces that it has installed a new division at the Detroit Works, consisting of a non-ferrous foundry department for the manufacture of cored and solid phosphor-bronze bushing bars in standard 12-inch lengths.

DAYTON RUBBER MFG. CO., Dayton, Ohio, announces that its patent on V-belts of rubber and fabric, which are widely used on automobiles and in many other types of mechanical drives, has been declared valid and was upheld by a recent decision by the United States Court at Columbus, Ohio.

THRALL TAYLOR DISTRIBUTORS, LTD., 3350 San Fernando Road, Los Angeles, Cal., has recently been organized to represent several local and eastern manufacturers. In addition to specializing in production engineering problems, this firm is equipped to build tools, jigs, and fixtures and to engage in light manufacturing.

HAYNES STELLITE CO., Kokomo, Ind., a unit of the Union Carbide & Carbon Corporation, has just completed a new foundry at the Kokomo Works, built expressly for the manufacture of Hastelloys, a group of new acid and corrosion-resistant alloys. These alloys are especially suitable for resisting hydrochloric acid and moist chlorine.

INLAND STEEL CO., Chicago, Ill., has just completed its new merchant bar mill which has been under construction for more than a year at the Indiana Harbor Works of the company. This mill is equipped to produce the smaller sizes of rounds, flats, squares, and shapes, as well as bands down to No. 12 gage and coiled material.

PECK, STOW & WILCOX CO., Southington, Conn., at its annual meeting July 30, elected the following officers: George S. Case, president; Charles F. Treadway, executive vice-president and treasurer; Frank L. Wilcox, vice-president; Otto J. Blank, vice-president; Mark J. Lacey, vice-president; and Arthur G. Potter, secretary and comptroller.

QUIGLEY CO., INC., 56 W. 45th St., New York City, announces that the company has purchased the business and good will of the ANNITE INDUSTRIES, formerly located at Washington, D. C., manufacturer of an industrial cleaning compound which is suitable for a great variety of purposes in machine shops and other industrial establishments.

HERBERTS MACHINERY CO., LTD., Los Angeles, Calif., has purchased the buildings, property, and machinery of the KEYSTONE IRON & STEEL CO. at 2915 Santa Fé Ave., Los Angeles, Calif., which will be the new home of the company. The main building is 410 by 100 feet, of reinforced concrete construction throughout. A new office building, 100 by 50 feet, will be erected to form part of the main building. The company was started fifteen years ago by C. A. Herberts, who organized it under the name of Herberts Machinery & Supply Co.,

C. A. Herberts, Head of the Herberts Machinery Co.

and it has had a steady growth ever since, representing, exclusively, in Southern California and Arizona some forty leading machine tool builders.

BARRETT-CRAVENS CO., Chicago, Ill., manufacturer of Barrett lift-trucks, Steeleg platforms, and portable elevators, moved into its new plant at 101 W. 87th St., Chicago, on September 1. This brings together, under the same roof, the Barrett-Cravens Co. and its two affiliated companies, the Walker Vehicle Co. and the Automatic Transportation Co.

MILWAUKEE MACHINERY CO., INC., Milwaukee, Wis., builder of metal- and wood-working machinery, compressors, and motors, has removed from 93 W. Water St. to 131-135 S. First St., Milwaukee, Wis. The new location gives the company three times its former amount of floor space, and, at the same time, the plant is more centrally located.

INDEPENDENT PNEUMATIC TOOL CO., 600 W. Jackson Blvd., Chicago, Ill., has opened a branch sales office at 6200 E. Slauson Ave., Los Angeles, Calif., where a complete line of Thor electric and pneumatic tools, as well as spare parts, will be carried in stock. Vernon Job, formerly manager of the San Francisco office, will be in charge of the new Los Angeles office.

EX-CELL-O AIRCRAFT & TOOL CORPORATION, 1200 Oakman Blvd., Detroit, Mich., announces the appointment of two new representatives: George B. Ashley, formerly with the Detroit Lubricator Co., has been assigned to the Syracuse territory, while William S. Gallagher, formerly associated with the R. C. Neil Co. in Buffalo, will have charge of the Buffalo territory.

LINK-BELT CO., 910 S. Michigan Ave., Chicago, Ill., announces that the company's Pacific Division has just moved into a new manufacturing plant and office at Paul Ave. near Bayshore Highway, San Francisco, Calif. The new plant consists of a two-story office building, a warehouse 80 by 120 feet, three stories high, and a manufacturing building containing machine shop, steel shop, plant office, and auxiliary departments. The plant will manufacture elevating, conveying, and power transmission equipment.

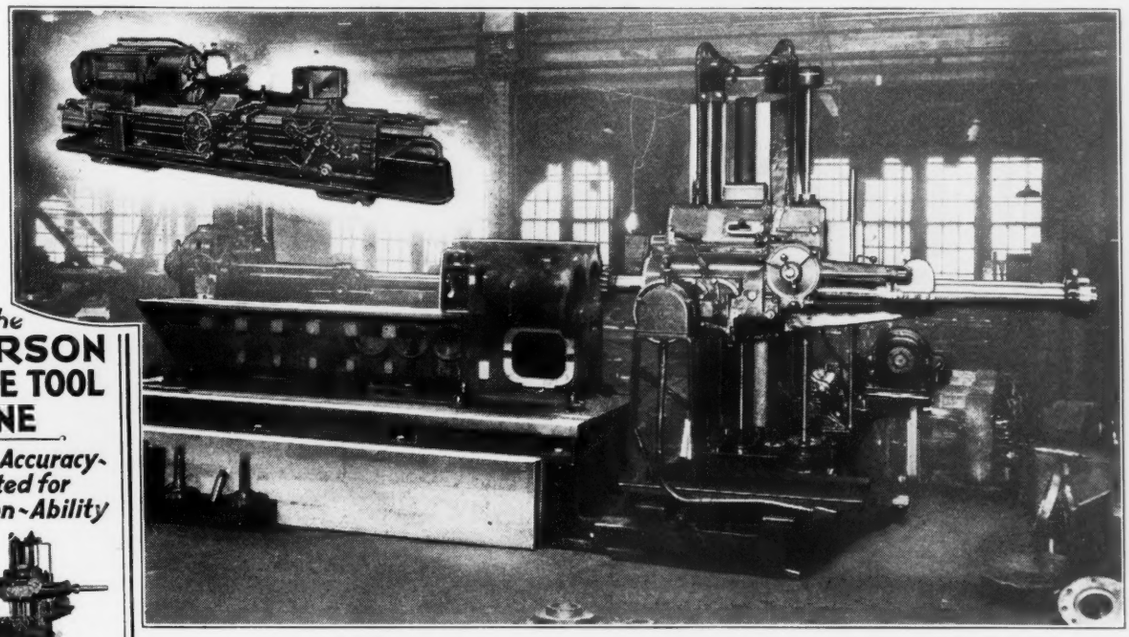
CARBORUNDUM CO., Niagara Falls, N. Y., has purchased the Abrasive Division of the American Glue Co. The new organization will be known as the UNION SAND PAPER DIVISION OF THE CARBORUNDUM CO. Manufacturing operations will be continued at the plants at East Walpole, Mass., and at Brantford, Ontario, Canada, where the coated abrasive products known as Union Brand, Alumite Brand, and by various other long-established trade names will be made. The main office of the Union Sand Paper Division will continue to be maintained at 121 Beverly St., Boston, Mass., with branches in New York, Chicago, Detroit, St. Louis, and High Point, N. C.

SIMONDS SAW & STEEL CO., Fitchburg, Mass., announces the purchase of a large tract of land in the easterly section of Fitchburg, Mass., on which will be erected a completely new plant for the manufacture of saws, machine knives, and files. The cost of the new plant will be approximately $1,500,000; it is expected to be in operation by June 1, 1931. Extensions of the steel mills of the company at Lockport, N. Y., where most of the special steel used for the Simonds company's products is made, are also under way. The new Fitchburg factory will provide unusually up-to-date manufacturing facilities.

PRATT & WHITNEY CO., Hartford, Conn., has purchased the JOHN-SONS GAGE WORKS of Hartford, Conn., manufacturers of screw thread gages. The machinery and the present stock of the acquired company will be moved to the plant of the Pratt & Whitney Co., where the gaging equipment produced by the John-Sons Gage Works will be manufactured under the Pratt & Whitney name. C. V. Johnson, Stanley Johnson, and Paul Johnson, owners of the John-Sons Gage Works, together with the entire trained personnel of the concern, will remain with the Pratt & Whitney Co. C. M. Pond, manager of the Small Tools and Gage Divisions of the Pratt & Whitney Co., will have direct supervision over the newly created department.

OHIO

HORIZONTAL BORING, DRILLING & MILLING MACHINES



Ohio Horizontal Working on the Headstock of a Libby Turret Lathe

This Job Requires a Precision Machine

Machining the Integral Headstock and Bed Casting for a Libby Turret Lathe

The picture above shows the standard floor type Ohio Horizontal Boring, Drilling and Milling Machine with a special raised bed arrangement used in the International Machine Tool Company plant at Indianapolis, Ind., for boring, drilling and milling the integral headstocks of Libby Turret Lathes.

As the headstock and bed are cast in one piece, extreme accuracy is required in boring out for the Timken Roller Bearings on the main spindle. This method of handling the work not only gives the required accuracy but has also considerably reduced the time required by previous methods. It assures perfect alignment of the various shaft centers and milled surfaces.

This floor type machine is built in 4", 4½" and 5" spindle diameters with vertical traverse up to 7′ 0" and horizontal traverse of post on runway to meet requirements. Bed plates, bar supports and other accessories to suit the work.

Ohio Horizontal Boring, Drilling and Milling Machines are also built in table type, planer table type, and combination floor and table type. Let us send you complete data on them. Write for descriptive bulletins.

THE OHIO MACHINE TOOL COMPANY

KENTON - - - - OHIO

General Distributors

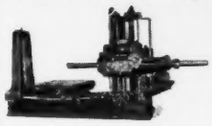
JOSEPH T. RYERSON & SON INC.

Offices in Chicago and 23 Other Principal Cities

SOLD THROUGH EXCLUSIVE DEALERS

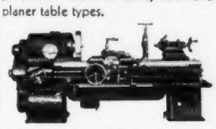
The
RYERSON MACHINE TOOL LINE

Built for Accuracy-Selected for Production-Ability



Ohio Horizontal Boring, Drilling and Milling Machines

Exclusive features assure permanent precision. Built in table, floor and planer table types.

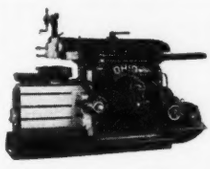


Monotrol and Tritrol Lathes

Two types—both showing remarkable results on their particular work. 14 to 30 inch sizes in standard and production types.

Dreses Radial Drills

Strong, well-built, accurate tools with many time and labor saving advantages. Sizes 3 to 8 feet inclusive.



Ohio Shapers and Planers

Recognized for accuracy, speed and power. Built in all standard types and sizes.

RYERSON
Machinery Division
General Distributors Machine Tools

Structural and Plate Working Equipment, Sheet Metal Tools —Welders, Railroad Shop Machinery, Small Tools, etc.

OBITUARIES

JAMES K. CULLEN

James K. Cullen, president of the Niles Tool Works Co., Hamilton, Ohio, died at Hot Springs, Va., Thursday, July 31. Mr. Cullen was born in Cincinnati

James K. Cullen

in 1853, and became connected with the Niles Tool Works Co. in 1879. After serving successively as foreman, superintendent, western sales manager, and secretary, he became president in 1900. Shortly afterward, the company was merged with the Niles-Bement-Pond Co. of New York, and in 1914 Mr. Cullen became president of the latter company. When the Niles Tool Works Co. again became separately managed, with headquarters in Hamilton, Ohio, in 1925, Mr. Cullen returned as president of the company, which position he held until his death. Thus Mr. Cullen devoted fifty-one years of active service to the interests of the Niles Tool Works Co.

DR. IRA NELSON HOLLIS

Dr. Ira Nelson Hollis, former president of the Worcester Polytechnic Institute, past president of the American Society of Mechanical Engineers, and one of the most widely known men in mechanical engineering circles, died at his home in Cambridge, Mass., August 15. Dr. Hollis was born at Mooresville, Ind., in 1856; he graduated from the United States Naval Academy in 1878, and served as an engineer in the Navy until 1893, when he became professor of engineering at Harvard University, a position which he held for twenty years, until he became president of the Worcester Polytechnic Institute. He retired from the presidency of the Institute in 1925. In 1917 he was made president of the American Society of Mechanical Engineers of which he was also an honorary member. He was awarded the honorary degrees of Master of Arts by Harvard University, Doctor of Laws by Union College, and Doctor of Science by the University of Pittsburgh. All those who knew Dr. Hollis held him in the highest esteem. Few men in the engineering profession will be remembered with as much affection.

FRANK J. OAKES

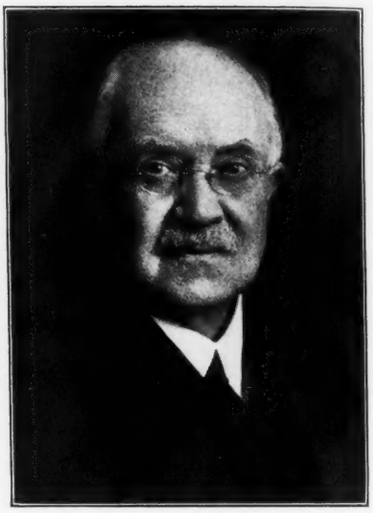
Frank J. Oakes, general superintendent of the Dodge Works of Link-Belt Co., Indianapolis, Ind., died suddenly on July 19 of apoplexy, aged fifty-four years.

Mr. Oakes was born October 10, 1875 at Decatur, Ill. He entered the service of the Link-Belt Machinery Co., Chicago, in 1894 as repair man and general machinist. In 1899, he obtained a leave of absence for one year to serve as repair man for the Mexican Central Railway in Chihuahua. On his return to Link-Belt Co. he served as repair man and assistant foreman in the sheet and structural iron department. In 1907 he was placed in charge of the tool-room, and in 1912 he was appointed foreman of the machine shop and tool-room. The next year he was transferred to Philadelphia, and two years later was made general superintendent of the Dodge Works, Indianapolis, which position he held at the time of his death.

Mr. Oakes was a member of the Society of Automotive Engineers, the American Gear Manufacturers' Association, and several other engineering societies.

WALTER L. CHENEY

Walter L. Cheney died at his home in Meriden, Conn., August 16, after a long illness. Mr. Cheney was born in Greenfield, Mass., in 1854. He learned the machinist's trade as an apprentice with the Pratt & Whitney Co., Hartford, Conn., and later was employed as a draftsman by the same concern. After having been employed by the Springfield Machine Tool Co., Springfield, Ohio, and the Warner & Swasey Co., Cleveland, Ohio, he became associate editor of MACHINERY in 1894, remaining in this capacity until



Walter L. Cheney

early in 1899, when he became connected with the New Home Sewing Machine Co., Orange, Mass. Until recently, Mr. Cheney was a frequent contributor to MACHINERY'S columns.

Leaving the New Home Sewing Machine Co., he was successively assistant superintendent of the Hancock Inspirator Co., Boston, Mass., and superintendent of the June Sewing Machine Co., Chicago, Ill., and of the American Sewing Machine Co., Philadelphia, Pa. Leaving this company, he became mechanical engineer of the Westinghouse Electric & Mfg. Co. at its Newark, N. J., plant, and later salesman for the Potter & Johnston Machine Co., Pawtucket, R. I. His last position, which he held for over twenty-five years, was as sales engineer for the Lucas Machine Tool Co., Cleveland, Ohio.

Mr. Cheney was a member of the American Society of Mechanical Engineers, the American Association for the Advancement of Science, and the Machinery Club of New York City. He had many warm friends throughout the entire machinery industry.

PERSONALS

NEIL OTEY has been appointed district manager of the Pittsburgh office of the Poole Engineering & Machine Co., Baltimore, Md. Mr. Otey's headquarters will be at 245 Union Trust Building, Pittsburgh, Pa.

JAMES F. DONAHUE, vice-president of the Lamson & Sessions Co., Cleveland, Ohio, sailed on the *Berengaria*, August 5, for a two months' vacation in Europe. Mr. Donahue is accompanied by his wife and daughter.

JAMES S. FENTON has been promoted to the position of sales engineer of the New York office of the Reliance Electric & Engineering Co., Cleveland, Ohio, manufacturer of alternating- and direct-current motors.

F. J. CONDIT has been appointed resident engineer of the Hevi Duty Electric Co., Milwaukee, Wis., with headquarters at Buffalo, N. Y. Mr. Condit was formerly located at the general offices of the company in Milwaukee.

J. C. TEN EYCK, JR., has been appointed eastern district sales manager for the W. F. & John Barnes Co., Rockford, Ill., and the John S. Barnes Corporation. Mr. Ten Eyck will be located at 7 E. 42nd St., New York City.

C. T. CONNELLY has been appointed manager of the Buffalo office of the Independent Pneumatic Tool Co., Chicago, Ill., manufacturer of Thor pneumatic and electric tools. Mr. Connelly was formerly located at the Detroit office.

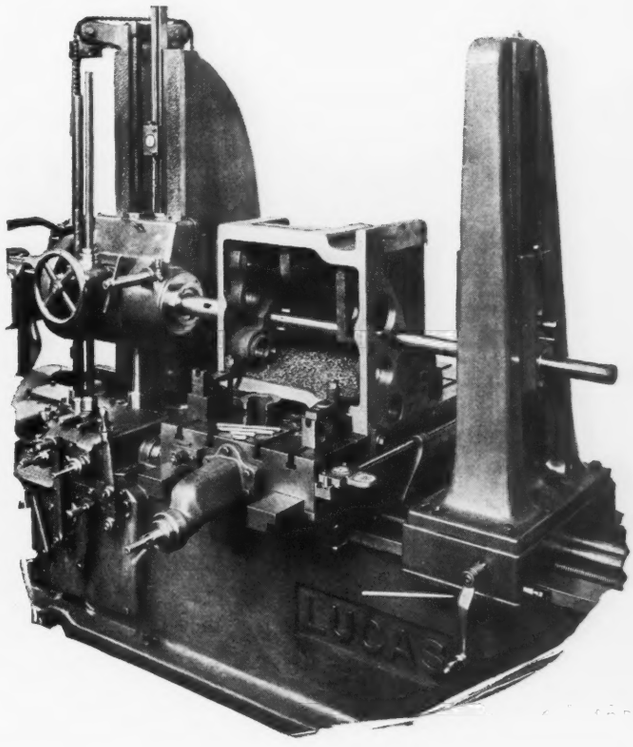
A. C. COOK, who has been with the Warner & Swasey Co., Cleveland, Ohio, for the last twenty-nine years, and who has been vice-president of the company

Lucas

BORING, DRILLING *and* MILLING MACHINE *with* Dial Indicator Indexing Device

Done in "Jig Time"

SIX gear centers are located by corresponding length gages, used on the vertical and cross adjustments, in boring the LUCAS Horizontal Boring Machine's own speed change gear box of the new, anti-friction bearing type, with multiple-splined shafts for the large, sliding gears. The dial indicators insure uniform tension in adjusting the slides and there is no appreciable wear to the comparatively inexpensive length gages, so accuracy is maintained without deterioration.



Let one of our representatives go over your work and our machine in detail. When may he call?

THE LUCAS MACHINE TOOL CO., Cleveland, Ohio

FOREIGN AGENTS: Allied Machinery Co., Barcelona, Zurich. V. Lowener, Copenhagen, Oslo, Stockholm. R. S. Stokvis & Zonen, Paris and Rotterdam. Andrews & George Co., Tokyo. Ing. M. Kocian & G. Nedela, Prague. Emanuele Mascherpa, Milan, Italy.

for the last five years, has resigned. His plans for the future have not yet been announced.

THOMAS W. QUILTER has been appointed manager of the Atlanta office of Robbins & Myers Sales, Inc., Springfield, Ohio, succeeding C. V. MALONE, who recently resigned. W. S. MOTTER has been appointed manager of the Philadelphia office of the company, succeeding R. C. DECKER.

E. C. WILSON, formerly in charge of the pricing group of the gear and reducer division of Foote Bros. Gear & Machine Co., Chicago, Ill., has recently been appointed assistant sales manager. He was previously assistant sales manager of the R. D. Nuttall Co., Pittsburgh, Pa.

CHARLES C. PHELPS, 11 Park Place, New York City, manufacturers' agent, has been appointed sales agent for metropolitan New York and northern New Jersey by the Leavitt Machine Co., Orange, Mass., manufacturer of the Dexter valve reseating machine for globe, gate, and pump valves.

EVERETT CHAPMAN has been appointed director of development and research for Lukenweld, Inc., Division of Lukens Steel Co., Coatesville, Pa. Mr. Chapman will have general direction of the laboratory and investigation work in connection with the redesigning of machinery parts for the welded steel type of construction.

E. F. LENOIR, former president and sales manager of the Union Electric Mfg. Co., Milwaukee, Wis., and later associated with Cutler-Hammer, Inc., after the consolidation of the Union Electric Mfg. Co. with the Cutler-Hammer, Inc., has recently joined the home sales organization of the Louis Allis Co., Milwaukee, Wis.

E. T. OLIVER, who for the last fifteen years has covered the northern Ohio territory, during eight years representing the Whitman & Barnes, Inc., has gone into business for himself as a manufacturers' agent at 2130 St. Clair Ave., Cleveland, Ohio. Mr. Oliver wishes to communicate with manufacturers looking for distribution in the northern Ohio territory.

FRANCIS A. EMMONS, vice-president of the Foote Bros. Gear & Machine Co., Chicago, Ill., has recently returned from a business trip to the West Coast. Mr. Emmons visited the company's representatives at Denver, Salt Lake City, Los Angeles, San Francisco, Portland, and Seattle and reports a general optimistic outlook for business during the latter part of 1930.

T. R. LANGAN has been appointed assistant northeastern district manager of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Mr. Langan has been connected with the company for more than twenty years. He will make his headquarters at New York City, and will also continue to serve as manager of the transportation division of the northeastern district.

H. S. BARTHOLOMEW, production and cost engineer, has been appointed directing head of the newly created cost engineering department of the Steel Founders' Society of America. Mr. Bartholomew was formerly with the firm of Cooley & Marvin, cost engineers, Boston, Mass. His new office will be at the headquarters of the Steel Founders' Society, 420 Lexington Ave., New York City.

WILLIAM PIEZ has been appointed European correspondent of the Link-Belt Co., Chicago, Ill., with a view to creating a closer contact with the Link-Belt agents and customers in Europe and North Africa. Mr. Piez, who is a brother of Charles Piez, chairman of the Link-Belt Co., was district manager of the Concrete Steel Co., Chicago, Ill., until September, 1928, since which time he has lived in Paris.

CLAUDE O. STREETER, who for the last eighteen years has been chief mechanical engineer of the Graton & Knight Co., Worcester, Mass., is now connected with the Schwartz Belting Co., 76 Murray St., New York City, in a similar capacity. Mr. Streeter will assist the Schwartz Belting Co.'s customers in solving their power transmission problems, with a view to applying leather belting in the most economical manner.

GEORGE W. W. CORNMAN, treasurer and manager of the service department of the Brown Instrument Co., Philadelphia, Pa., retired from business August 8. Mr. Cornman has been associated with the instrument business for thirty-five years, formerly being secretary and treasurer of the Keystone Electrical Instrument Co. When that organization was absorbed by the Brown Instrument Co., he became treasurer and a director and was the active head of the service department. R. C. KENNAN takes Mr. Cornman's place as manager of the service department, and E. T. NAHILL becomes field supervisor.

FRANK DUSTAN of the engineering department of Putnam Machine Works, Fitchburg, Mass., of Manning, Maxwell & Moore, Inc., has been appointed chief engineer of that plant. Mr. Dustan, after having received his education in Canada, was connected with the General Electric Co. for six years at Schenectady, N. Y., and later with the Nova Scotia Steel & Coal Co. During the World War he was master mechanic of one of the largest munitions plants in Canada. In 1919, he joined Mann'ng, Maxwell & Moore, Inc., as a designer and has since held the positions of assistant chief draftsman and sales engineer, specializing in railroad and steel mill machinery.

COMING EVENTS

SEPTEMBER 10-11—Meeting of the Steel Founders' Society of America, at the William Penn Hotel, Pittsburgh, Pa. G. P. Rogers, Managing Director, 932 Graybar Bldg., New York City.

SEPTEMBER 22-24—Fourth annual meeting of the Machine Shop Practice Division of the American Society of Mechanical Engineers. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

SEPTEMBER 22-26—Annual convention of the American Society for Steel Treating at the Stevens Hotel, Chicago, Ill. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

SEPTEMBER 22-26—Twelfth Annual National Metal Exposition under the auspices of the American Society for Steel Treating at the Stevens Hotel, Chicago, Ill. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, O.

SEPTEMBER 22-26—National Metal Congress at the Stevens Hotel, Chicago, Ill., in conjunction with the annual convention of the American Society for Steel Treating and the annual fall meetings of the Metals Division and the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers; the Iron and Steel Division and the Machine Shop Practice Division of the American Society of Mechanical Engineers; and the American Welding Society.

SEPTEMBER 24-27—Eleventh annual convention of the American Trade Association Executives to be held at Clifton House, Niagara Falls, Ontario, Canada. Roscoe C. Edlund, chairman, program committee, 45 E. 17th St., New York City.

SEPTEMBER 29 - OCTOBER 1 — Semi-annual meeting of the American Gear Manufacturers' Association at Niagara Falls, Canada; headquarters, Hotel Clifton. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

OCTOBER 7-8—Production Meeting of the Society of Automotive Engineers at the Book-Cadillac Hotel, Detroit, Mich. R. S. Burnett, director, production activities, Society of Automotive Engineers, 29 W. 39th St., New York.

OCTOBER 8—Third annual convention of the Gray Iron Institute, to be held at the Hotel Cleveland, Cleveland, Ohio. Arthur J. Tuscany, manager, Terminal Tower Building, Cleveland, Ohio.

OCTOBER 15-17—Seventeenth national convention of the Society of Industrial Engineers, to be held at the Mayflower Hotel, Washington, D. C. George C. Dent, executive secretary, 205 W. Wacker Drive, Chicago, Ill.

DECEMBER 1-6—Ninth National Exposition of Power and Mechanical Engineering in the Grand Central Palace, New York City.

DECEMBER 1-6—Fifty-first annual meeting of the American Society of Mechanical Engineers in the Engineering Societies Building, New York City. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

FEBRUARY 16-20, 1931—Second National Western Metal Congress and Exposition to be held in the Civic Auditorium, San Francisco, Calif., under the auspices of the American Society for Steel Treating. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland, Ohio.

SOCIETIES, SCHOOLS AND COLLEGES

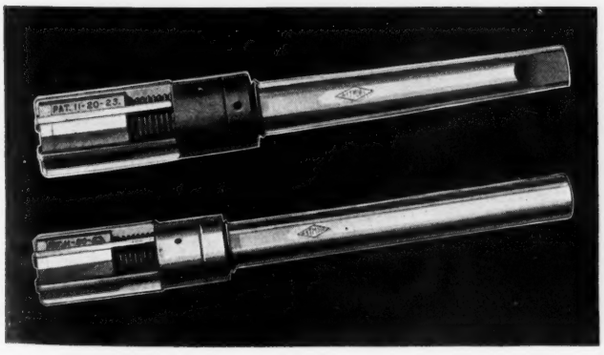
POLYTECHNIC INSTITUTE, Brooklyn, N. Y., announces an evening course covering Diesel engines. The course will start September 30 at 7:30 P.M., and will consist of twenty lectures to be given Tuesday evenings during the winter season.

WETMORE

ADJUSTABLE REAMERS

Wetmore is an organization of reamer specialists. It manufactures no other product. Its reputation and future depend entirely on the precision and performance of the reamers it supplies to American industry. Hence, an inferior reamer never leaves the Wetmore plant. The name WETMORE on a reamer is the last word in accuracy, finish, and durability . . . . . Send for latest catalog of all types of Wetmore Adjustable Machine and Cylinder Reamers and replacement blades.

WETMORE REAMER COMPANY
60 27th Street MILWAUKEE, WISCONSIN



WETMORE

TYPE NO. 8 CHUCKING REAMERS

These machine reamers are especially designed for reaming brass, bronze, and cast iron. To adjust, there are no unnecessary screws or pins to be loosened. Adjustment to .001 inch is quickly and accurately made by cone nut and lock nut at rear of blades. Straight blades are held securely by special, exclusive method. Sizes range by thirty-seconds from $\frac{5}{8}$" to $\frac{31}{32}$" inclusive.

NEW BOOKS AND PUBLICATIONS

STANDARD TRADE CUSTOMS OF THE STEEL FOUNDRY INDUSTRY. 16 pages, 4 by 7 inches. Published by the Steel Founders' Society of America, Inc., 932 Graybar Bldg., New York City.

TENSION TEST OF RIVETS. By Wilbur M. Wilson and William A. Oliver. 38 pages, 6 by 9 inches. Bulletin 210 of the Engineering Experiment Station, University of Illinois, Urbana, Ill. Price, 25 cents.

A STUDY OF SLIP LINES, STRAIN LINES, AND CRACKS IN METALS UNDER REPEATED STRESS. By Herbert F. Moore and Tibor Ver. Bulletin 208 of the Engineering Experiment Station, University of Illinois, Urbana, Ill. Price, 25 cents.

MACHINE SHOP UNIT—Part III. Process sheets prepared by machine shop instructors in the vocational schools of Wisconsin. Edited by H. C. Thayer. 12 sheets, 8½ by 11 inches. Published by the McGraw-Hill Book Co., New York City. Price, 35 cents.

This collection of instruction sheets covers, among other subjects, taper boring in the lathe, use of follower rest, boring in the drill press, grinding lathe centers, sharpening drills, cutter grinding, shaper work, end milling, indexing in the milling machine, and spur gear cutting.

LIFE EXPECTANCY OF PHYSICAL PROPERTY. By Edwin B. Kurtz. 205 pages, 6 by 8 1/2 inches; 90 charts and 60 tables. Published by the Ronald Press Co., New York City. Price, $6.

The engineer concerned with valuation, appraisal, and depreciation problems, which are constantly becoming more and more important in industry, has hitherto found very little dependable information available on the life expectancy of physical property. The present book, therefore, should serve a useful purpose in that it places on record information that has been compiled by the author over a period of fourteen years. In this book, are furnished what might be called mortality tables of industrial equipment and property. In addition, a study is presented of the characteristics that affect the life of industrial equipment and property, and it is believed by the author that these basic findings will become the foundation stones on which theories of depreciation and valuation will be erected as superstructures. Engineers whose work is concerned with methods of depreciation should find in this volume much information that will be useful to them.

NEW CATALOGUES AND CIRCULARS

MOTORS. Louis Allis Co., Milwaukee, Wis. Bulletin 510, descriptive of the Louis Allis Type J totally enclosed fan-cooled squirrel-cage motor.

MACHINE RINGS. Heppenstall Co., Bridgeport, Conn. Circular illustrating equipment used for manufacturing machine rings on a production basis.

LOCK-WASHERS. Shakeproof Lock Washer Co., 2501 N. Keeler Ave., Chicago, Ill. Circular showing various applications of Shakeproof lock-washers.

INDUSTRIAL PAINT. Norfolk Paint & Varnish Co., Norfolk Downs, Mass. Catalogue of paints and varnishes for all kinds of industrial purposes.

ELECTRIC MOTORS. Bodine Electric Co., Oakley Blvd. and Ohio St., Chicago, Ill. Bulletin 1002-B, illustrating and describing Bodine series intermittent service motors, with and without speed reducers.

AIRCRAFT INSTRUMENTS. Pioneer Instrument Co., Inc., 754 Lexington Ave., Brooklyn, N. Y. Circular treating of the principles and operation of Pioneer aviation instruments. Instruction manual for Pioneer instruments.

PORTABLE POWER UNITS. Westinghouse Electric & Mfg. Co., East Springfield Works, East Springfield, Mass. Circular outlining the application and operation of portable power units for use on construction and repair jobs.

GRINDING WHEEL DRESSERS AND CUTTERS. Desmond-Stephan Mfg. Co., Urbana, Ohio. Catalogue on grinding wheel dressers and cutters, containing information and illustrations covering mechanical, abrasive, and diamond grinding wheel dressers.

ARC WELDING. Automatic Arc Welding Co., 11 W. 42nd St., New York City. 62-page booklet entitled "Automatic Arc Welding," containing a history of arc welding, an outline of the principles of arc welding, and a review of the Morton arc welding patents.

CONVEYING MACHINERY. Stephens-Adamson Mfg. Co., Aurora, Ill. Leaflets containing descriptions and specifications of the S-A heavy-duty box-car loader, as well as the standard type of box-car loader, which may be used for loading both cars and ships.

WELDING EQUIPMENT. Linde Air Products Co., 30 E. 42nd St., New York City. Pamphlet entitled, "Production Welding," illustrating and describing the application of the oxy-acetylene process as a production method in several of the important industries.

ELECTRICAL MEASURING DEVICES. Roller-Smith Co., 233 Broadway, New York City. Supplement 2 to Bulletin 100, descriptive of the Type PD direct-current voltammeters for signal system and automatic train control testing, and the Type HTD headlight tester.

TRUCKS. Barrett-Cravens Co., 101 W. 87 St., Chicago, Ill. Circular entitled "— and You Can Prove It!" illustrating the saving in labor effected through the application of Barrett barrel trucks, as compared with the old method of handling barrels with the ordinary two-wheel factory trucks.

FLEXIBLE SHAFTS. United States Electrical Tool Co., 2477 W. Sixth St., Cincinnati, Ohio. Catalogue covering the new line of flexible shafts which are made in sizes ranging from 1/4 to 3 horsepower. The catalogue also shows a complete line of tools for engraving, filing, polishing, grinding, etc.

RAILROAD EQUIPMENT. Whiting Corporation, Harvey, Ill. Catalogue entitled "Modern Methods in Repair Shops," descriptive of Whiting terminal equipment, including drop pit tables; locomotive hoists; locomotive spotters; coach hoists; car washers and scrubbers; cranes; and miscellaneous equipment.

CONVEYING EQUIPMENT. Cleveland Electric Tramrail Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio. Circular entitled "Do not Build More Ovens," illustrating Cleveland tramrail systems provided with rack carriers for transporting products through cleaning, painting, and drying ovens.

MOTORS. Reliance Electric & Engineering Co., 1042 Ivanhoe Road, Cleveland, Ohio. Circular entitled "Color to Lengthen Motor Life," descriptive of Reliance direct-current motors which are coated with a bright orange colored enamel in order to enable dirt to be easily detected. This coating is also said to provide excellent insulation.

TURRET LATHES. International Machine Tool Co., Indianapolis, Ind. Catalogue of the Libby-International Type H heavy-duty turret lathe, containing complete illustrated descriptions of the design and construction of the different sizes, with specifications. Standard and special tools used in connection with these machines are also illustrated and described.

FORGINGS. Heppenstall Co., Pittsburgh, Pa. Catalogue describing the characteristics of Heppenstall forgings and illustrating the wide variety of applications for which they are suitable. The catalogue also contains tables of weights of square and round steel bars and circumferences and areas of circles, and tables for converting millimeters into inches, etc.

HEAT-TREATING EQUIPMENT. Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa. Catalogue 90, dealing with the Hump method for the heat-treatment of steel. This is a new edition of the catalogue, the new material treating particularly of the automatic control of the rate of heating in and above the critical range, as well as below it, in the Hump furnace.

SCREW MACHINES. Davenport Machine Tool Co., 167 Ames St., Rochester, N. Y. Catalogue illustrating and describing in detail the improved Model B Davenport multiple-spindle automatic screw machine. The catalogue contains many detailed views which show clearly the construction of the various parts and attachments. It gives complete specifications covering capacity, speeds, dimensions, weight, etc.

PUNCH PRESS FEEDS. F. J. Littell Machine Co., 4125 Ravenswood Ave., Chicago, Ill. Catalogue 27, descriptive of the various types of automatic punch press feeds made by this concern, including roll feeds, dial feeds, chute and hopper feeds, magazine feeds, etc. The last part of the book is devoted to special machinery made by the company, among which are listed roller assembling machines, straightening and feeding machines, ball turning lathes, etc.

AUTOMATIC SCREW MACHINES. National Acme Co., Cleveland, Ohio. Handbook for operators of Acme Model C five-spindle automatic screw machines. This book covers the design, construction, tool equipment, and operation of this type of machine. Instead of showing the parts by halftones, they are presented by line drawings, which make it possible to show the details more clearly. This is the first operators' handbook that has been issued by the company for the Model C.

BELT CONVEYORS. Link-Belt Co., 300 W. Pershing Road, Chicago, Ill. 176-page data book, No. 1615, on belt conveyors, containing information on the selection and application of the proper type of belt conveyor for handling any material in the desired quantities. Among the subjects discussed are: Belt conveyor drives; belt stresses; care, lubrication, and maintenance of belt conveyor idlers; dimensions, prices, and data concerning various types of idlers and driving mediums; feeders and their selection; general data on motors; selection of the idler; selection of a belt conveyor for handling a given material at the desired speed; various types of trippers; etc.

ELECTRIC EQUIPMENT. General Electric Co., Schenectady, N. Y. Bulletins GEB-82, GEA-192F, 579A, 585B, 708A, 722B, 754A, 771A, 785B, 1052A, 1158A, 1257, 1265A and 1266, dealing, respectively, with explosion-chamber oil circuit breakers; portable farm motors; full-voltage controllers; switchboard recording instruments; general-purpose synchronous motors, 7600 Series; Selsyns for remote signaling, control, and indication; semi-automatic reduced-voltage starters; automatic switching equipment; G.E. air drawing oven; general-purpose synchronous motors, 7500 Series; cost of operating electric appliances and motors; mechanical-drive turbines; thermostats for use with industrial heating units; and photo-electric relays.